

APPENDIX P:

Grassland Birds: A Review of Avian Impact Analysis Methods and Potential Impact Assessment for the Illiana Corridor



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Executive Summary

The potential for adverse effects to grassland birds as result of construction of the Illiana Corridor was identified as an issue in preparing the Tier One Environmental Impact Statement (EIS). In general, there are two methods for assessing potential impacts to grassland birds based on available literature: 1) Distance as the Criteria for Impact, or 2) Noise Levels and Species-specific Data as the Criteria for Impact. The purpose of this document is to:

1. Evaluate the feasibility and applicability of the two methods for assessing potential impacts to grassland bird species;
2. Recommend a method to be used to determine if the Corridor would potentially impact avian species.

Forman et al. (2002) concluded overall impact to grassland bird presence from roadways are negative and Reijnen et al. (1996) concluded small bird density adjacent to roadways exhibited a negative effect. Warner (1992) concluded there were no roadway effects on grassland bird total abundance. Based on the available literature, assumptions, and limitations of studies completed to date, no definitive way of defining impacts for all avian species has been identified.

Studies correlating distance with reduced breeding and/or foraging are considered to take into account all potential variables which may overestimate the potential impacts to grassland species from roadway operations (i.e. roadway noise, lighting, air pollution, soil vibration). Studies using noise levels and species specific data are relatively new, data is limited, requires species specific data, and are limited to determining potential masking impacts only, which do not account for potential physiological and behavioral impacts.

Based on the available literature, assumptions and limitations of studies completed to date, a review of the ecological and biological characteristics of grassland species studied and those known to occur within the Midewin National Tallgrass Prairie (MNTP), it was determined the Forman et al. (2002) study is the most applicable to the proposed project. The project team recommended using the impact distances as determined by Forman et al. (2002) to evaluate the impact to grassland species from the Illiana Corridor. The criteria for assessing impacts to grassland bird species was presented to the Resource Agencies (US Fish and Wildlife Service [USFWS], US Environmental protection Agency [USEPA], US Army Corps of Engineers[USACE], Illinois Department of Natural Resources [IDNR], and Midewin National Tallgrass Prairie [MNTP]) on April 16, 2013. Concurrence on using distance as the criteria for assessing impacts to grassland bird species was given at this meeting.

Utilizing the Forman et al. (2002) study, areas of potential impact within the boundaries of MNTP and the Des Plaines Conservation Area (DPCA), existing passerine and grassland bird habitat, and upland sandpiper habitat were calculated. In addition, the

potential number of known loggerhead shrike nests impacted was calculated. Specific information on existing passerine and grassland bird habitat, upland sandpiper habitat, and loggerhead shrike (Illinois state endangered) nesting locations were provided by MNTP.

The alternatives and design options all potentially impact the same amount of area within MNTP, existing passerine and grassland bird habitat, upland sandpiper habitat, and loggerhead shrike nests. Potential impacts within the DPCA range from 305 acres to 644 acres. Alternative 3 with Design Options 2, 3, 4, 5, or 6 potentially impacts the least amount of area within the DPCA at 305 acres. Table ES-1 summarizes the potential impacts to DPCA, MNTP, and avian habitat.

Table ES-1. DPCA, MNTP, and Avian Habitat Area of Potential Impact

Alternative	Area of Potential Impact within DPCA (Acres)	Area of Potential Impact within MNTP (Acres)	Area of Potential Impact to Existing Passerine and Grassland Bird Habitat (Acres)¹	Area of Potential Impact to Upland Sandpiper Habitat (Acres)^{1,2}	Number of Loggerhead Shrike Nest Potential Impacts¹
Alternative 1	330-644 ³	149	73.15	62	2
Alternative 2	323-598 ³	149	73.15	62	2
Alternative 3	305-615 ³	149	73.15	62	2

¹ Only located within Midewin National Tallgrass Prairie property.

² The area of upland sandpiper habitat is located wholly within the passerine and grassland bird habitat.

³ Design Options 2, 3, 4, 5, and 6 impact the least amount of area and Design Option 1 impacts the largest amount of area

Utilizing the distances calculated by Forman (2002) to determine potential impacts to DPCA and the most conservative distance grassland birds are known to avoid tree lines, it was determined that there are limited remaining potential habitat patches (discrete areas) within the DPCA. These remaining patches vary in size from 0.03 acres to 6.77 acres. As previously stated, the potential habitat is currently agricultural land and the DPCA currently has no plans to restore this or adjacent areas to grassland bird habitat. Therefore, it is anticipated that grassland birds are not using these areas within the DPCA. There are no impacts to grassland birds within the DPCA.

A literature review was conducted to estimate population capacity for grassland birds at MNTP. Determining whether the potential impact to MNTP is substantial was assessed based on potential area impacted and determining the potential population capacity of grassland birds at MNTP. The alternatives potentially impact 29.6 ha (73.15 acres or 0.9 percent) of the current grassland bird habitat within MNTP. Approximately 50.3 ha (124 acres or 1.3 percent) of potential passerine and grassland bird habitat within MNTP is expected for the future desired conditions (MNTP GIS information). Given the large expanse of the patches **potentially impacted it is not expected to** preclude an area sensitive species from using the patch. MNTP would still support patches of grassland

habitat that exceed the minimum area requirements of the most area sensitive species. Potential population capacity of grassland birds at MNTP was assessed using density information from available literature and the MNTP 2012 avian survey. Using the most conservative (lower) density values indicated that only four species, with available density values and known to occur within MNTP, exceed their population capacity within MNTP using current and future desired grassland habitat. The population capacity within MNTP is exceeded for these four species using the density information from available literature. For all other species, with available density values known to occur within MNTP, population capacity within MNTP is reduced by approximately 1 percent for individual species with the proposed Illiana project. For the loggerhead shrike, a species with known specific population data within MNTP and using the most conservative (lower) density value, it is anticipated the MNTP would support approximately 38 additional individuals with the proposed Illiana Corridor project.

Therefore, the proposed project will not be a substantial impact to grassland birds within MNTP. The area impacted within MNTP will not remove enough area from a habitat patch that would preclude an area sensitive species from using a patch. Population capacity information indicates sufficient capacity is present within MNTP.

Several land cover types in Indiana may be potential grassland bird habitat. While over 100 acres of potential grassland bird habitat is present within the Corridor in Indiana, these areas are fragmented and interspersed within a highly agricultural, forested, and residential area.

Studies correlating distance with reduced breeding or foraging are considered to take into account all potential variables, which may overestimate the potential impacts to passerine species from roadway operations (i.e. roadway noise, lighting, air pollution, etc.). Therefore, studies correlating distance with reduced breeding or foraging was determined to be a conservative measure of the potential for roadways to potentially impact grassland species. Mitigation for potential impacts to grassland bird habitat will be developed and coordinated with the Resource Agencies (USFWS, US EPA, USACE, IDNR, and MNTP).

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1.0 Introduction

The potential for adverse effects to grassland birds as a result of construction of the Illiana Corridor was identified as an issue in preparing the Tier One Environmental Impact Statement (EIS). With the selection of the preferred corridor, the Tier Two environmental studies focused more specifically on the consequences to various environmental resources, including grassland birds. In general, there are two methods for assessing potential impacts to grassland birds based on available literature: 1) Distance as the Criteria for Impact, or 2) Noise Levels and Species-specific Data as the Criteria for Impact. The purpose of this document was to:

1. Further evaluate the feasibility and applicability of the two methods for assessing potential impacts to grassland bird species;
2. Recommend a method to be used to determine if the Corridor would potentially impact avian species.

An extensive review of peer-reviewed papers, Federal Highway Administration (FHWA) research, and information prepared for the California Department of Transportation (Caltrans) was conducted to identify methods for determining potential impacts to passerine (including grassland) species from roadway projects. A total of 36 papers were reviewed, and a specific focus was given to studies that included grassland species.

Particular attention was paid to passerine species as the Midewin National Tallgrass Prairie (MNTP) is an Important Bird Area (IBA) recognized by the National Audubon Society, due to the presence of grassland and other bird species (National Audubon Society, Inc., 2013). According to the US Fish and Wildlife Service (USFWS), grassland birds are one of the most imperiled groups of birds in the world. The State of the Birds 2011 Report on Public Lands and Waters lists grassland birds among the fastest declining species and notes that the percentage of grassland birds on public lands is low because less than 2 percent of designated public lands is both publicly owned and managed for conservation (State of the Birds, 2011). The Midewin Des Plaines Goose Lake Prairie Conservation Opportunity Area (COA) is considered an “ecologically important grassland ecosystem” (Illinois DNR, 2005). The COA is one of 31 such areas in the state of Illinois and encompasses all of MNTP. The western terminus of the Corridor is located within the COA, which spans from south of the City of Joliet to north of the City of Braidwood and from west of the City of Morris to the Village of Manhattan.

The complexity of determining the effect of noise on avian species is exemplified by several studies that show positive, neutral, and/or negative effects for specific avian species (Räty, 1979; Forman, 1998; Peris & Pescador, 2003; FHWA, 2004; Kaseloo, 2006; Fahrig & Rytwinski, 2009; Benítez-López, et al., 2010; Robinson, et al., 2012). Benítez-López, et al. (2010) reviewed 49 studies (201 bird species), with ratios of species abundances at disturbance distances and at control distances from roadways, and did

not find a significant effect of traffic intensity on mean species abundance; however, species of international and national significance fare worse than other species, and the effect distance is greater in grassland than in woodland habitat (Reijnen and Foppen, 2006).

From the literature review, two methods for quantifying the potential impacts to passerine species are presented in this technical report: 1) impact based on distance from the roadway or 2) impact based on roadway noise levels and species-specific data. There are significant species differences in the ability of avian species to hear in noisy environments which suggests that one model, or a certain noise level above ambient, is not likely to fit all species under all conditions (Dooling, 2005).

2.0 Confounding Factors

2.1 Study Variables

There are no studies definitively identifying traffic noise as the critical variable affecting birds with regard to stress and physiological effects near roadways (Dooling, 2007; Slabbekoorn and Ripmeester, 2007). Other potential variables are visual disturbance, chemical pollution, road-kills, and soil vibration (Slabbekoorn and Ripmeester, 2007). Results indicate support for the hypothesis that human-caused noise will adversely affect bird communities (Stone, 2000; Herrera-Montes et al., 2011), and Reijnen and Foppen (1994) hypothesize that a possible important cause of the reduced habitat quality in the road zone is noise.

Forman et al. (2002) concluded overall impact to grassland bird presence from roadways are negative and Reijnen et al. (1996) concluded small bird density adjacent to roadways exhibited a negative effect. Warner (1992) concluded there were no roadway effects on grassland total abundance; however, Warner limited his research to narrow strips of right-of-way, which may not meet the habitat area requirements of certain grassland species. Of the species for which traffic noise impact studies have been conducted, five species exhibiting positive impacts and eight species exhibiting negative impacts were identified during the 2012 MNTP avian survey (MNTP, 2013). On an individual basis, approximately 18.5 percent of birds identified during the 2012 MNTP avian survey exhibited negative impacts from roadway noise, compared to approximately 10.3 percent that exhibited positive impacts and approximately 0.03 percent that exhibited no impacts (MNTP, 2013).

2.1.1 Acoustic Signal Characteristics of Passerine Species

There are significant differences in the ability of different avian species to hear in noisy environments which suggests that one model, or a certain noise level above ambient, is not likely to fit all species under all conditions (Dooling, 2007). Following Dooling's (2007) three classes of potential effects, the ecological and biological characteristics critical in determining impacts from roadway noise are: (1) physiological and behavioral; (2) hearing; and (3) masking of important bioacoustic and communication signals.

If there are significant species differences indicating positive, neutral, and/or negative effects for specific avian species (Räty, 1979; Forman, 1998; Peris & Pescador, 2003; Federal Highway Administration [FHWA], 2004; Kaseloo, 2006; Fahrig & Rytwinski, 2009; Benítez-López, et al., 2010; Robinson, et al., 2012) and traffic noise is the critical variable affecting birds, a comparison of acoustic signal characteristics is necessary. Identifying acoustic signal characteristics of species which have been studied and comparing those characteristics with species which have not been studied may predict the effect of traffic noise.

The list of avian species from the surveys conducted during 2012 in MNTP was reviewed and select species were used for the comparison with species studied by Forman et al. (2002), Veen (1973), and van der Zande (1980). Selected species included those with the greatest numbers during the 2012 surveys as well as state listed threatened and endangered species. The bobolink (*Dolichonyx oryzivorus*) and the eastern meadowlark (*Sturnella magna*) were studied by Forman et al. (2002). The black-tailed godwit (*Limosa limosa*), lapwing (*Vanellus vanellus*), Eurasian oystercatcher (*Haematopus palliatus*), and redshank (*Tringa totanus*) were studied by Veen (1973) and van der Zande (1980). The bobolink and eastern meadowlark are both known to occur within MNTP and both had some of the greatest number of occurrences during the 2012 survey.

Hearing and discrimination of sounds is critical in bobolinks as observations of song sharing suggest songs and the male's ability to discriminate between two different song types (Martin, et al., 1995). Similar to the bobolink, the upland sandpiper (*Bartramia longicauda*) has several call types including the long mellow whistle vocalization, given as a sexual display during courtship, and the tattler call vocalization, given as an alarm by both males and females (Houston et al., 2011).

Table 2-1 depicts the call frequency of species compared. The approximate vocalization frequency of species studied in Forman et al. (2002), Veen (1973), and van der Zande (1980) are similar. As roadway noise monitoring has demonstrated, the highest noise levels are generated at low frequencies, peaking around 2 kHz and rapidly decreasing at higher frequencies. Therefore, it is anticipated that vocalizations at low frequencies would be impacted to a greater extent than vocalization at a high frequency.

The bobolink and eastern meadowlark are the only specific species studied by Forman that are present within MNTP. Forman showed these two species exhibited a potential negative impact from roadways. As no studies definitively identify traffic noise as the critical variable affecting birds with regard to stress and physiological effects near roadways (Dooling, 2007; Slabbekoorn and Ripmeester, 2007) ecological and biological characteristics may be important factors. For example, the red-winged blackbird has the same vocalization frequency as other passerine species (Table 2) and exhibits one of the most conservative masked threshold curves (Dooling, 2002); however it has exhibited increased density adjacent to roadways (Warner, 1992; Adams & Geis 1981 and Clark & Karr 1979, as reported by FHWA, 2004). Therefore, it may be hypothesized that a variable (an ecological or biological characteristic of the red-winged blackbird) other than traffic noise accounts for the increased presence of red-winged blackbirds adjacent to roadways.

Table 2-1. Approximate Vocalization Frequency of Selected Avian Species

Species	Approximate Vocalization Frequency (kHz)
Species Studied by Forman et al. (2002), Veen (1973), and van der Zande (1980)	
Bobolink ¹	2-9
Eastern meadowlark ¹	1-6
Black-tailed godwit	0.5-10
Lapwing	1-10
Eurasian Oystercatcher	0.5-9
Redshank	0.5-8
Species Identified during the 2012 Avian Survey within MNTP	
Bell's Vireo (<i>Vireo bellii</i>)	3-8
European Starling (<i>Sturnus vulgaris</i>)	1.5-10
Blue Jay (<i>Cyanocitta cristata</i>)	0.25-10
Song Sparrow (<i>Melospiza melodia</i>)	1-12
Field Sparrow (<i>Spizella pusilla</i>)	2-8
American Robin (<i>Turdus migratorius</i>)	2-4
Red-winged Blackbird (<i>Agelaius phoeniceus</i>)	0.5-8
Henslow sparrow (<i>Ammodramus henslowii</i>)	3-11
Upland sandpiper (<i>Bartramia longicauda</i>)	0.5-4.5
Loggerhead shrike (<i>Lanius ludovicianus</i>)	0.5-12
Dickcissel (<i>Spiza americana</i>)	3-10

¹ The bobolink and eastern meadowlark were identified within MNTP during the 2012 MNTP avian survey.

Source: BNA, 2013; Michigan State University AVoCet Database, 2013, Cohen et al., 1978)

The redshank and Eurasian oystercatcher breed in coastal salt marshes and are occasionally found in grasslands; they are not known to occur within MNTP. Due to habitat and other ecological and biological differences of the redshank and oystercatcher (BirdLife International, 2013) compared to passerine species within MNTP, roadway effects on the redshank and oystercatcher may not be similar. The bobolink (Martin et al., 1995) and eastern meadowlark (Jaster et al., 2012) share similar ecological and biological characteristics with Henslow's sparrow, upland sandpiper, and loggerhead shrike. The similar characteristics include, but are not limited to, habitat type and range, vocalization frequency, predator avoidance behavior, and methods of mate attraction. The majority of characteristics rely on hearing and vocalizations that if affected would have an impact on the species.

Cohen et al. (1978) determined hearing thresholds of pure tones for blue jays within a 0.25 to 10 kHz range. Dooling et al. (1979) determined hearing thresholds of pure tones

for the field sparrow within a 0.25 to 12 kHz range. Cohen et al. (1978) also presents audibility curves as reported by others for the bullfinch, starling, brown-headed cowbird, canary, crow, and red-winged blackbird. Audibility curves represent the lowest sound pressure that a species can detect at a specific frequency throughout the species range of hearing (Dooling, 2002). The hearing thresholds for all species reported follow a “U” shape curve with greater sound pressure thresholds at low and high frequency extremes of the hearing spectrum and lower sound pressure thresholds at the optimum hearing frequency.

The critical ratio describes the ratio between the power of a pure tone at the hearing threshold and the power per Hertz of the background noise. Critical ratio data has been determined for 14 avian species and show a common pattern in all species except the barn owl (*Tyto alba*), budgerigar (*Melopsittacus undulatus*), and great tit (*Parus major*) (Dooling 2002). For example, a pure tone at 3 kHz must be 28 dB above the spectrum level of the background noise in order to be detected. The critical ratio allows for the determination of whether an avian species can detect a noise in background noise but does not determine whether an avian species can discriminate the noise. Of the 20 passerine species with an absolute and/or masked threshold curve generated, only eight are known within MNTP (from the 2012 survey; MNTP, 2013). Table 2-2 depicts the species that have absolute threshold and masked threshold curves generated and are present within MNTP (MNTP, 2013).

Table 2-2. Passerine Species Present in MNTP with Absolute and/or Masked Threshold Curves Generated

Species	Absolute Threshold Curve Generated (Y/N)	Masked Threshold Curve Generated	Present in MNTP ¹	
			Sum of <100m	Sum of >100m
American Robin	Y	--	84	65
Blue Jay	Y	--	11	29
Brown-Headed Cowbird (<i>Molothrus ater</i>)	Y	Y	32	0
European Starling	Y	Y	279	99
Field Sparrow	Y	--	121	120
House Sparrow (<i>Passer domesticus</i>)	Y	--	1	0
Red-Winged Blackbird	Y	Y	687	284
Song Sparrow	Y	Y	63	19

¹ Species counts from 2012 avian survey within MNTP. Count of individual birds at distances between surveyor and identified bird of less than 100 meters and greater than 100 meters.

Source: MNTP, 2012; Audiograms of species as reported by Dooling, 2002

The masked threshold curves of passerine species are very similar, exhibiting an increasing logarithmic curve, with the lowest critical ratio of approximately 20 dB. Therefore, in the absence of specific data for a given passerine species, using the most conservative masked threshold curve from species that have been studied is anticipated to give a conservative critical ratio estimate.

2.2 Land Use

As no studies have definitively identified traffic noise as the critical variable affecting birds, other sources of noise may contribute to the stress and physiological effects near roadways. There are significant differences in the ability of different avian species to hear in noisy environments which suggests that one model, or one noise level above ambient, is not likely to fit all species under all conditions (Dooling, 2007). The complexity of determining the effect of noise on avian species is exemplified by several studies that show positive, neutral, and/or negative effects for specific avian species (Räty, 1979; Forman, 1998; Peris & Pescador, 2003; FHWA, 2004; Kaseloo, 2006; Fahrig & Rytwinski, 2009; Benítez-López, et al., 2010; Robinson, et al., 2012).

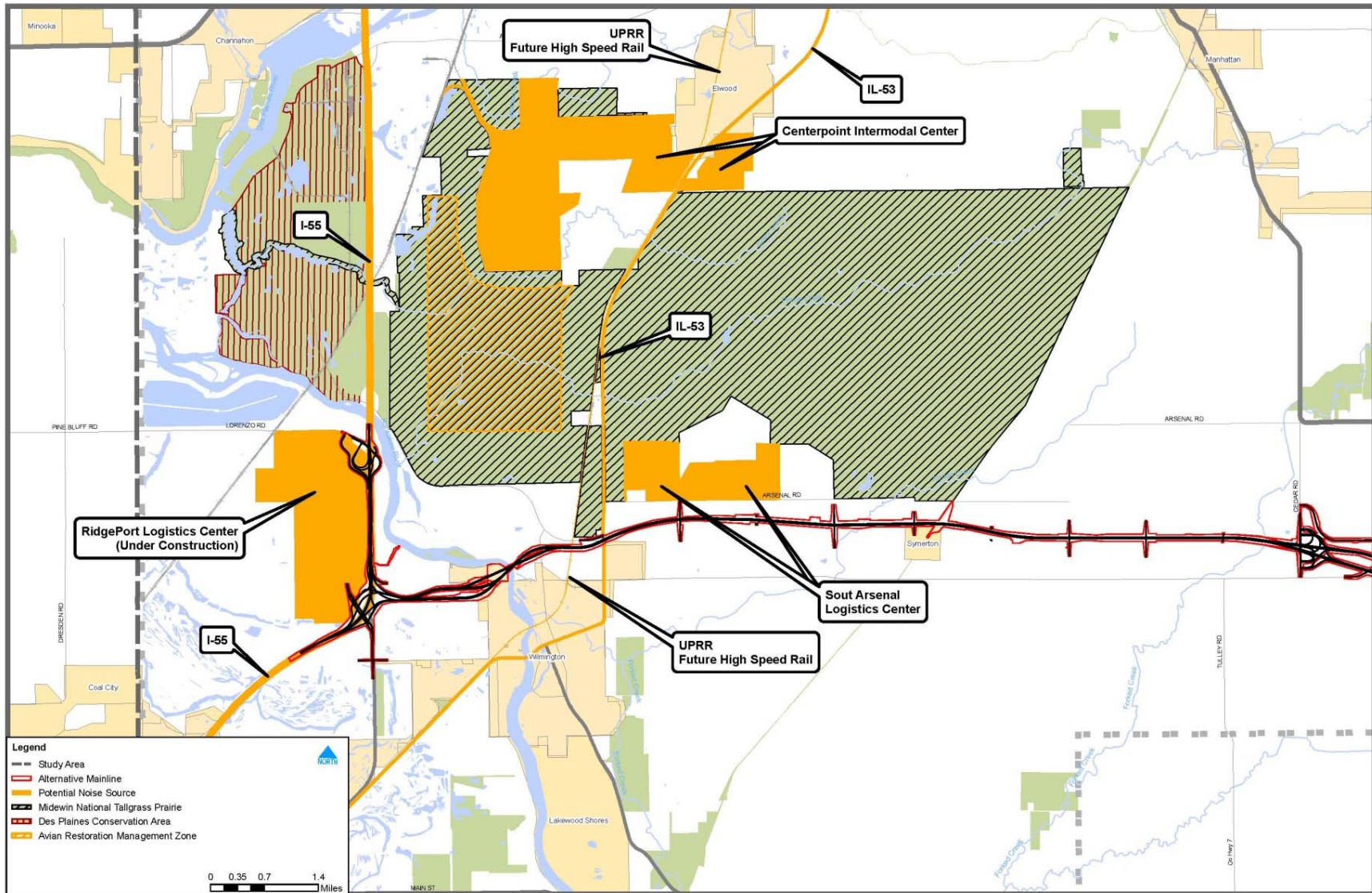
Anthropogenic noise varies with different land uses (USEPA, 1974). It is anticipated the existing, planned, and future land use within the Elwood, Wilmington and Manhattan Development Area, are anticipated to influence ambient noise levels within MNTP. Figure 2-1 depicts the locations of these noise sources and future land use in relation to MNTP.

Ambient noise within known grassland habitat could be currently influenced by noise from surrounding land use consisting of roads (i.e., Interstate 55 [I-55], Illinois Route 53 [IL-53], and South Arsenal Road), the existing Union Pacific Railroad with both passenger and freight railroad traffic, and commercial/industrial development (i.e., the Burlington Northern Santa-Fe Logistics Park, South Arsenal Logistics Center, and Prologis Park Arsenal) (AECOM, 2010). The development within the South Arsenal Logistics Center and Prologis Park Arsenal (also known as the Joliet Arsenal Development Authority [JADA]) is not built out at this time. The completion of this planned developed could increase ambient noise levels.

Planned development including the South Suburban Airport (SSA), which is approximately 11.5 miles east of MNTP, Ridgeport intermodal facility, and the Chicago to St. Louis high speed rail could further contribute to noise levels in the area. The SSA Draft Environmental Considerations Report does not address potential impacts to avian species (IDOT, 2012).

The Manhattan regional planning area includes areas adjacent to the northeast corner of MNTP (Village of Manhattan, 2008). The proposed land use adjacent to MNTP includes office, research, and industrial area as well as the Hoff District, defined as major non-residential uses including office, research, industrial, commercial, agrotourism, and agriculture (Village of Manhattan, 2008). As this area is currently agricultural, it is anticipated development of this area will increase ambient noise levels within MNTP.

Figure 2-1. Potential Noise Sources on Grassland Habitat with the Midewin National Tallgrass Prairie



2.3 Current/Future Traffic

Traffic volume, traffic speed, and number of trucks influence the amount of noise generated by a roadway (IDOT, 2011). Therefore, noise levels increase with increasing traffic volumes. Table 2-3 depicts the existing and 2040 projected traffic volumes for several roadways within the vicinity of MNTP. Studies conducted during the Tier Two process focused on those projected volumes associated with the Illiana Corridor in the vicinity of IL-53 and MNTP, as compared to the 2040 No Build volumes shown below.

Table 2-3. Existing and 2040 Projected No Build Traffic Volumes

Road	Segment	2010 Existing	2040 No Build
IL-53	S. Arsenal Road to Illiana	8,500	23,700
IL-53	Illiana to Peotone Road	9,000	23,900
S. Arsenal Road	IL-53 to Old Chicago Road	300	6,700
Old Chicago Road	S. Arsenal Road to Illiana	100	2,800
Old Chicago Road	Illiana to Peotone Road	100	2,800
Peotone Road	IL-53 to Old Chicago Road	2,100	10,200

Source: Illiana Traffic data obtained March 26, 2013.

2.4 Precedents

The CenterPoint Intermodal Center (CIC) North project required consultation with Illinois Department of Natural Resources (IDNR) for potential impacts to passerine habitat at the Joliet Training Area (JTA). As mitigation opportunities within the JTA are limited, habitat restoration on land managed by the US Army (scheduled for transfer to MNTP in 2010) was the selected restoration location. Potential passerine habitat impacts from the CIC North Project stem from the extension of Baseline Road through the JTA. The extension of Baseline Road resulted in 64 acres of potential direct impact (road construction) and 233 acres potentially indirectly impacted by roadway noise. The CIC North Project utilized the distances of potential impact developed by Forman et al. (2002) to locate the restoration areas outside the potential roadway noise impact area of IL-53, the Union Pacific rail yard, and I-55.

The Bioacoustics Research Team (1997), as reported by Dooling (2007), concluded that 60 dBA, averaged over a time period such as one hour or 24 hours, is a single, simple criterion to use as a starting point for potential passerine impacts until more specific research is done. The County of San Diego has adopted the Bioacoustics Research Team (1997) recommendation within their noise guidelines (County of San Diego, 2009) and this value was followed for the Draft Programmatic Environmental Impact Report prepared for the San Luis Rey River Park Master Plan (County of San Diego, 2008) and for a pipeline project (HELIX, 2010) in assessing the potential impact on the least Bell's vireo (*Vireo bellii pusillus*).

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3.0 Distance as the Criteria for Impact

3.1 Overview/Background

Several studies have created simple models for predicting the distance at which breeding bird populations may be affected by traffic noise (Veen, 1979; Reijnen, 1995; Forman, 2002). The Bioacoustics Research Team (1997), as reported by Dooling (2007), criticized Reijnen (1995) for poor statistical analysis, poor controls, and lack of analysis of individual bird species. Therefore, Reijnen (1995) was removed from consideration¹. No additional studies correlating the distance effect from traffic have been conducted in the past 10 years.

Forman et al. (2002), mainly studying the bobolink and eastern meadowlark, found that grassland bird presence correlates positively with distance from busy roads (15,000 and greater average daily traffic [ADT]), but does not correlate with distance from lower traffic roads (between 3,000 and 8,000 ADT). For ADT between 3,000 and 8,000, there is no evidence of an effect of roads on presence or on regular breeding. For roads with 8,000 to 15,000 ADT no effect on bird presence is evident but breeding is reduced or eliminated for a distance of 400 meters (1,312 feet). For roads with 15,000 to 30,000 ADT no grassland birds are present or regularly breeding for 700 meters (2,296 feet) and for greater than 30,000 ADT both presence and breeding are reduced for 1,200 meters (3,937 feet) (Forman, 2002).

Veen (1973) and van der Zande et al. (1980) found rough indications that the distance-density relationship is logistic and traffic volume to total population loss is possibly logarithmic. Of the four avian species, the lapwing, black-tailed godwit, redshank, and Eurasian oystercatcher studied in open grassland areas, the black-tailed godwit, redshank, and Eurasian oystercatcher avoided rural roads to a distance of 500-600 meters (1,640-1,968 feet), for 50 vehicles per average weekday. Busy highways with 54,000 vehicles per average weekday were avoided by these species to a distance of 1,600-1,800 meters (5,249-5,905 feet), and up to 2,000 meters (6,561 feet) for the lapwing.

3.2 Applicability to the Illiana Corridor

Further research into the biology and ecology of passerine species studied by Forman et al. (2002), Veen (1973), and van der Zande (1980) was conducted. The research, as presented in Section 2.1, sought to compare the species studied with those species which are present within MNTP. This comparison was conducted to determine the study

¹The Bioacoustics Research Team (1997), as reported by Dooling (2007), criticized Reijnen (1995) for poor statistical analysis, poor controls, and lack of analysis of individual bird species. The data was pooled so that it presented a possible effect on all birds, rather than determining whether there are species-specific effects, which has been emphasized in several other studies (Räty, 1979; Forman, 1998; FHWA, 2004; Kaseloo, 2006; Fahrig and Rytwinski, 2009; Benítez-López, et al., 2010; Robinson, et al., 2012). In addition, the number of birds studied was too low for reliable statistical measures, and levels of significance used varied between study years.

which is most applicable to the Illiana Corridor. Based on the literature review of species biological and ecological characteristics as presented in Section 2.1, it was determined species studied by Forman et al. (2002) were more applicable to the proposed project than those studied by Veen (1973) and van der Zande et al. (1980).

3.3 Method for Analysis

As detailed in Section 3.2, the Forman et al. (2002) study was determined to be the most applicable methodology for the proposed project. Evaluating potential impact to passerine habitat using Forman et al. (2002), impact distances were assigned to several roadways adjacent to passerine habitat based on 2040 projected traffic volumes for the tolled and non-tolled scenario. Distances were measured from the proposed edge of pavement of the roadways.

3.4 Analysis limitations

As the distance criteria for impact was selected, a quantifiable potential impact to passerine species was developed; however, if potential mitigation options that would reduce the level of noise within passerine habitat, such as an earthen berm, are selected the reduction of potentially impacted habitat cannot be quantified. No research on the effectiveness of mitigation measures for passerine species has been conducted.

The Forman et al. (2002) and Veen (1973) and van der Zande et al. (1980) studies are considered to take into account variables in addition to masking, such as physiological and behavioral effects, as well as variables not related to roadway noise (air pollution, adjacent anthropogenic noise effects, etc.). Therefore, these studies are considered to take into account all potential impact variables, which may overestimate the potential impacts to passerine species from roadway operations (i.e., roadway noise, lighting, air pollution, soil vibration).

4.0 Noise Levels and Species-specific Data as the Criteria for Impact

4.1 Overview/Background

Studies seeking to identify a threshold noise level that impacts avian species are relatively recent. The Bioacoustics Research Team (1997), as reported by Dooling (2007), concluded that 60 dBA, averaged over a time period such as one hour or 24 hours, is a single, simple criterion to use as a starting point for potential passerine impacts until more specific research is done. The County of San Diego has adopted the Bioacoustics Research Team (1997) recommendation within their noise guidelines (County of San Diego, 2009) and this value was followed for the Draft Programmatic Environmental Impact Report prepared for the San Luis Rey River Park Master Plan (County of San Diego, 2008) and for a pipeline project (HELIX, 2010) in assessing the potential impact on the least Bell's vireo.

In a report on the effects of highway noise on birds prepared for Caltrans it was concluded that:

1. Hearing damage does not occur as noise does not reach levels capable of causing auditory damage and/or permanent threshold shift based on empirical data on hearing loss in birds from the laboratory;
2. Temporary threshold shift (TTS) is 93 dB(A) from estimates based on study of TTS by continuous noise in the budgerigar, also known as common pet parakeet, and similar studies in small mammals;
3. Masking occurs at levels above ambient dB(A); and
4. Potential behavioral/physiological effects result from any audible component of highway noise which has the potential of causing behavioral and/or physiological effects independent of any direct effects on the auditory system of permanent threshold shift (PTS), TTS, or masking. (Dooling, 2007)

As traffic noise levels do not approach 93 dB(A) it is not anticipated that traffic noise will cause a TTS or hearing damage in avian species known to occur within MNTP. At a background level of ambient noise typical of a quiet suburban area, data from masking studies of 14 bird species would suggest masking is present at noise levels in the range of 50-60 dB(A), and as low as 45 dB(A) (West et al., 2007); however, this range of values is based on average data, representing the typical bird. Bird species vary considerably in how they hear with background noise. Traffic noise characteristics are influenced by transmission through the environment as are the spectral, temporal, and intensive aspects of bird vocalizations at least in terms of differences in excess attenuation for different environments. Therefore, guidance for impact determination must accommodate these variables which are specific to the species and to the environment (Dooling, 2007).

For the purpose of determining the effects of noise on bird hearing, the relevant measure is the spectrum level of noise (defined as the energy level for each frequency in the sound) in the frequency region where birds vocalize most and hear best. This is typically around 2-4 kHz for passerine species. Estimating the spectrum level in the region of 2-4 kHz from an overall noise metric, such as dB(A), will overestimate the energy in the region of 2-4 kHz compared to a flat spectrum noise. Thus, in most cases, the overall level of the noise measured as dB(A) does not provide an accurate estimate of the noise level in the frequency region where birds communicate acoustically (Dooling, 2007). This methodology allows for the quantification of potential mitigation options, such as an earthen berm, on noise levels in passerine habitat.

4.2 Additional Research

Two of the most important functions of avian acoustic signals are territory defense and mate attraction (Slabbekoorn and Ripmeester, 2007). Masking of acoustic signals would impact the hearing or vocalization of signals for functions such as territory defense and mate attraction. It is logical to then anticipate that masking acoustic signals would lead to a lesser ability of a bird to defend territory or attract mates.

Data needed to allow for precise modeling of masking effect of traffic noise includes, types, levels, preferred singing location preferences, habitat characteristics, territory size for specific species, and the effect of habitat characteristics on vocalization and noise transmission (Dooling, 2007). In the absence of species specific data average values from masked threshold curves generated for passerine species could be used.

Conducting absolute and masking threshold studies on species of concern will give project specific data, increasing the validity of the study and provide additional valuable information to the scientific community. In addition, determining the noise levels of avian acoustic signals throughout the vocalization frequency is needed to evaluate the potential for masking.

This method is a simplistic approach to determine the potential impact of traffic noise on masking and does not address the potential physiological/behavioral impacts of traffic noise. Additional studies on the potential physiological and behavior impacts of traffic noise on specific species are needed in order to make this method encompassing of all potential impacts to avian species. This project provides an opportunity to study the potential impact of roadway noise on passerine species. The study has the potential to include a wide variety of passerine species (as limited species specific data is currently available) and which could be used as the basis for determining potential passerine impacts for future projects.

4.3 Method for Analysis

The following section details a proposed methodology for evaluating whether the Illiana Corridor is masking passerine acoustic signals.

4.3.1 Ambient Noise Monitoring

Conducting noise monitoring within known passerine habitat (and traffic counts) would give baseline noise levels within the spectral region of passerine species vocalizations. Ambient noise monitoring would be conducted in accordance with FHWA and the Illinois Department of Transportation (IDOT) approved noise measurement techniques. Ambient noise within known passerine habitat could currently be influenced by the surrounding road network and land use. Existing and proposed restored habitat identified by MNTP would be monitored for ambient noise. Noise contours within existing and proposed passerine habitat within MNTP could be determined for frequencies within passerine species acoustic signal range.

As the Illiana Corridor is located at distances greater than 500 meters from passerine habitat, the general noise attenuation rule of a decrease of three dB(A) for each doubling of distance will be used from monitored locations.

4.3.2 Masking of Passerine Species Vocalizations from Ambient Noise

Using ambient noise levels, the distance over which the acoustic signals of an avian species travels can be determined. Data from absolute and masking threshold studies as well as noise levels of specific species throughout their vocalization range is required. The distance over which the vocalization travels under ambient noise conditions would be considered the baseline which potential impacts would be compared too.

4.3.3 Projected Noise Levels

Projected noise levels of the Illiana Corridor could be modeled as part of the Tier Two studies using the Highway Traffic Noise Model (TNM) Version 2.5. The output of the TNM model will be dB(A), which would be converted to dB for each frequency using CadnaA or SoundPLAN. Noise contours within existing and proposed passerine habitat within MNTP could be determined for frequencies within passerine species acoustic signal range. These noise contours will be considered the 2040 ambient noise levels in passerine habitat with the Illiana Corridor.

An alternate method for determining projected noise levels would be to conduct noise monitoring on an existing road with similar ADT and truck traffic as the Illiana Corridor.

4.3.4 Masking of Passerine Species Vocalizations from Projected Noise Levels

Using projected noise levels for each frequency, the distance over which the acoustic signals of an avian species travels can be determined for the projected 2040 condition. As the proposed project is located at distances greater than 500 meters from passerine

habitat, a general noise attenuation rule of a decrease of three dB(A) for each doubling of distance would be used from monitored locations. Data would be compared to that obtained from Section 4.3.2 and utilized to determine if projected noise levels exceed ambient conditions and are masking avian species acoustic signals. This change would be the potential impact of the proposed project on ambient noise levels in passerine habitat.

4.4 Analysis limitations

This method is a simplistic approach to determine the potential impact of traffic noise on masking and does not address the potential physiological and behavioral impacts of traffic noise. There is no precedent for this type of analysis as limited experiments and knowledge on specific traffic noise levels for specific species is available.

Frequency data from the future/modeled situation may be obtained from SoundPLAN or CadnaA, which are not approved by FHWA for noise analysis.

5.0 Recommendation

Based on the available literature, assumptions and limitations of studies completed to date, a review of the ecological and biological characteristics of passerine species studied and those known to occur within MNTP, it was determined that the Forman et al. (2002) study presents the most applicable methodology for purposes of assessing potential impacts to avian species associated with the Illiana Corridor. The project team recommended using the impact distances as determined by Forman et al. (2002) to evaluate potential impacts to passerine species from the proposed project. This recommendation was presented to the Resource Agencies (US Fish and Wildlife Service [USFWS], US Environmental protection Agency [USEPA], US Army Corps of Engineers [USACE], Illinois Department of Natural Resources [DNR], and MNTP) on April 16, 2013 for concurrence.

There are no studies definitively identifying traffic noise as the critical variable affecting birds with regard to stress and physiological effects near roadways (Dooling, 2007; Slabbekoorn and Ripmeester, 2007). There are significant differences in the ability of different avian species to hear in noisy environments which suggests that one model, or a certain noise level above ambient, is not likely to fit all species under all conditions (Dooling, 2007). Species-specific effects have been emphasized in several other studies (Räty, 1979; Forman, 1998; FHWA, 2004; Kaseloo, 2006; Fahrig and Rytwinski, 2009; Benítez-López, et al., 2010; Robinson, et al., 2012).

Studies using noise levels and species specific data are relatively new and data is limited. Studies using noise levels and species specific data will only determine if masking will occur and does not evaluate potential physiological and behavioral modifications or impacts. Dooling (2007) noted several avian species have exhibited behavioral modifications in order to hear in noisy environments; however, the research is limited to specific species and may not be applicable to the species known to occur within MNTP. Therefore, studies using noise levels and species specific data were determined to have the potential to underestimate the potential impacts to grassland species.

Due to limited research on addressing physiological and behavioral effects and traffic noise model limitations, it was recommended that noise levels and species specific data not be used as the criteria for potential impact. Carefully constructed experiments, as well as careful attention to the uniqueness of potential noise impacts of specific species, are needed in order for this method of analysis to be validated. It is anticipated that when research on the physiological and behavioral effects of roadway operations is coupled with increased research on the masking effect of roadway noise, the studies using noise levels and species specific data will more accurately identify potential impacts.

Studies correlating distance with reduced breeding or foraging are considered to take into account all potential variables, which may overestimate the potential impacts to passerine species from roadway operations (i.e., roadway noise, lighting, air pollution,

etc.). Only a few species were evaluated in the correlational studies, and no additional studies have been conducted in the past 10 years. Therefore, studies correlating distance with reduced breeding or foraging was determined to be a conservative measure of the potential for roadways to impact grassland species.

6.0 Impacts

There are significant differences in the ability of different avian wildlife to hear in noisy environments which suggests that one model, or a certain noise level above ambient, is not likely to fit all species under all conditions (Dooling, 2007). The criteria for assessing potential impacts to grassland bird species was presented to the Resource Agencies (USFWS, USEPA, USACE, Illinois DNR, and MNTP) on April 16, 2013. Concurrence on using distance as the criteria for assessing potential impacts to grassland bird species was given at this meeting.

Potential Impacts to grassland bird species from the Illiana Corridor were assessed using impact distances developed by Forman et al. (2002). The potential impacts developed will be assumed to apply to all grassland bird species known to occur within MNTP. Forman et al. (2002) identified impact distances based on ranges of Average Daily Traffic (ADT). The impact distances for each range of ADT are summarized as follows:

- 8,000 to 15,000 ADT – Avian breeding is reduced or eliminated for 400 meters (1,312 feet)
- 15,000 to 30,000 ADT – Avian species are not present or regularly breeding for 700 meters (2,296 feet)
- >30,000 ADT – Avian presence and breeding are reduced for 1,200 meters (3,937 feet)

Table 6-1 depicts the traffic volume and distance from edge of pavement for the various roadway segments using the tolled scenario. Impact distances were only assigned to roadway segments where the projected 2040 build ADT exceeded the Forman et al. (2002) impact ADT ranges as compared to the projected 2040 no-build ADT. For example, a roadway segment with a projected 2040 no-build ADT of 15,000-30,000 would not be assigned an impact distance if the projected 2040 build ADT is also 15,000-30,000.

Illinois Route 53

As shown in Table 2-3, 2040 traffic on IL-53 is projected to be within the 15,000 to 30,000 ADT range for the No Build option. As improvements to IL-53 through MNTP are not proposed as part of the Illiana Corridor, potential impacts to grassland bird species from IL-53 traffic were not calculated for scenarios where 2040 ADT on IL-53 is within the 15,000 to 30,000 ADT range. The IL-53 2040 traffic for the No Build option is between 15,000 and 30,000 indicating that impacts could be expected to occur within 700 meters of IL-53 under the baseline No-Action scenario. Table 6-1 indicates that the projected 2040 ADT for IL-53 from South Arsenal Road to the Corridor surpasses the 30,000 ADT threshold. As the 2040 ADT exceeds the 15,000 to 30,000 ADT range, an impact distance of 1,200 meters was assigned for this segment. Therefore, the impact to grassland bird habitat directly attributed to the proposed roadway is between 700 meters and 1,200 meters along IL-53, from South Arsenal Road to the proposed Illiana Corridor.

Table 6-1. ADT and Potential Impact Distance for the Corridor – Tolloed Scenario

Road	Segment	2010 ADT Existing	2040 ADT (No Build)	2040 ADT (Build)	Potential Impact Distance (meters)
IL-53	Hoff Road to South Arsenal Road	7,850	23,100	21,600-25,900	-- ¹
IL-53	South Arsenal Road to Illiana	8,500	23,700	30,300-35,700	1,200 ¹
IL-53	Illiana to Peotone Road	9,000	23,900	26,700-27,100	-- ¹
South Arsenal Road	IL-53 to Riley Road	50	8,200	5,500-6,700	--
South Arsenal Road	Riley Road to Old Chicago Road	50	7,100	1,100-2,700	--
Riley Road	South Arsenal Road to Illiana	50	2,200	5,300-9,100 ²	--/400 ²
Riley Road	Illiana to Peotone Road	50	2,200	5,300-8,300 ²	--/400 ²
Peotone Road	IL-53 to Riley Road	4,250	11,400	8,100-10,900	--
Peotone Road	IL-53 to Riley Road	4,250	9,200	8,300-11,300	--
Illiana (mainline)	I-55 to IL-53	N/A	N/A	16,900-30,200 ³	700-1,200 ⁴
Illiana (mainline)	IL-53 to Riley Road	N/A	N/A	16,900-20,100	700
Illiana (mainline)	East of Riley Road	N/A	N/A	16,900-20,900	700
I-55 (mainline)	North of Illiana	34,900	44,700	43,500-46,700	--
I-55 (mainline)	South of Illiana	28,200	38,500	41,500-44,100	--

¹ – 2040 traffic for the No Build option is between 15,000 and 30,000 indicating that impacts could be expected to occur within 700 meters of IL-53 under the baseline No-Action scenario.

² - The 2040 ADT for Design Option 2, 3, and 4 exceed 8,000. A potential impact distance of 400 meters is used for Design Options 2, 3, and 4.

³ - The 2040 ADT for Design Option 1 exceeds 30,000.

⁴ – A potential impact distance of 700 meters is used for Design Options 2, 3, 4, 5, and 6. A potential impact distance of 1,200 meters was used for Design Option 1

Mainline Illiana

Potential Impacts to passerine and grassland birds were assessed for the Illiana mainline roadway for the tolled scenario. The focus of the potential impact assessment will be MNTP as the site of the largest avian habitat in the Study Area. The remainder of the Study Area was investigated to determine whether other areas of grassland bird habitat are present. Other potential areas of grassland bird habitat include the Des Plaines River Conservation Area (DPCA) and the Des Plaines State Wildlife and Game Propagation area near the Kankakee River and near Cedar Creek and Lake Dalecarlia in Indiana.

6.1 Potential Impacts to Passerine and Grassland Bird Habitat

6.1.1 Des Plaines Conservation Area

Utilizing the distances from the roadways within the boundaries of DPCA, potential passerine and grassland bird habitat was calculated. Table 6-2 summarizes the potential impacts to the DPCA.

Table 6-2. DPCA Area of Potential Impact

Alternative	Potential Area of Impact within DPCA (Acres)
Alternative 1	330-644 ¹
Alternative 2	323-598 ¹
Alternative 3	305-615 ¹

¹ Design Options 2, 3, 4, 5, and 6 potentially impacts the least amount of area and Design Option 1 potentially impacts the largest amount of area

Figure 6-1 depicts the impacts within the boundary of the DPCA. Potential impacts within the DPCA range from approximately 305 acres to 644 acres. Alternative 3 with Design Options 2, 3, 4, 5, or 6 potentially impacts the least amount of area within the DPCA at 305 acres. Land use within the area of avian habitat consists of agricultural with forested hedgerows which provide limited habitat for grassland birds. Passerine and grassland bird habitat has not be designated within the DPCA.

Limited habitat for grassland birds is present within the DPCA. From an aerial review of the DPCA property, the land use consists of agricultural fields surrounded by tree lines. Grassland birds avoid tree lines at varying distances; 72 meters for eastern meadowlarks, 104 meters for bobolinks, 125 meters for dickcissels, 126 meters for Henslow's sparrows, and 215 meters for grasshopper sparrows (Peterson, 2010). Applying the most conservative distance from the tree line (72 meters) a buffer was created signifying the potential area avoided by grassland birds.

There are limited potential remaining habitat patches (discrete areas) which vary in size from 0.03 acres to 6.77 acres within the DPCA. Figure 6-2 depicts the potential area avoided by grassland birds and potential habitat remaining within the potentially impacted area of DPCA for Alternative 3 with Design Options 2, 3, 4, 5, or 6. Figure 6-3

depicts the potential area avoided by grassland birds and potential habitat remaining within the potentially impacted area of DPCA for Alternative 1 with Design Option 1. As previously stated, the potential habitat is currently agricultural land and the DPCA currently has no plans to restore this or adjacent areas to grassland bird habitat. Therefore, it is anticipated that grassland birds are not using the potential area of grassland bird impact within the DPCA or areas immediately adjacent to the potential area of impact. There are no impacts to grassland birds within the DPCA.

6.1.2 MNTP

Utilizing the distances from the roadways, areas within the boundaries of MNTP, existing passerine and grassland bird habitat, and upland sandpiper habitat were calculated. In addition, the potential number of known impacted loggerhead shrike nests were identified. Specific potential impact information on existing passerine and grassland bird habitat, upland sandpiper habitat, and loggerhead shrike nesting locations were provided by MNTP. Table 6-3 summarizes the potential impacts to MNTP and avian habitat. The alternatives and design options for the Corridor all potentially impact the same amount of area within MNTP.

Table 6-3. MNTP and Avian Habitat Area of Potential Impact

Alternative	Area of Potential Impact within MNTP (Acres)	Area of Potential Impact to Existing Passerine and Grassland Bird Habitat (Acres)¹	Area of Potential Impact to Upland Sandpiper Habitat (Acres)¹	Number of Loggerhead Shrike Nest Potentially Impacts¹
Alternative 1	149	73.15	62	2
Alternative 2	149	73.15	62	2
Alternative 3	149	73.15	62	2

¹ Only located within MNTP property.

² Design Options 2, 3, 4, 5, and 6 potentially impacts the least amount of area and Design Option 1 potentially impacts the largest amount of area

Potential Impact Within the Boundary of MNTP

Figure 6-1 depicts the potential impacts within the boundary of MNTP. Alternatives 1, 2, and 3 potentially impact 149 acres within MNTP.

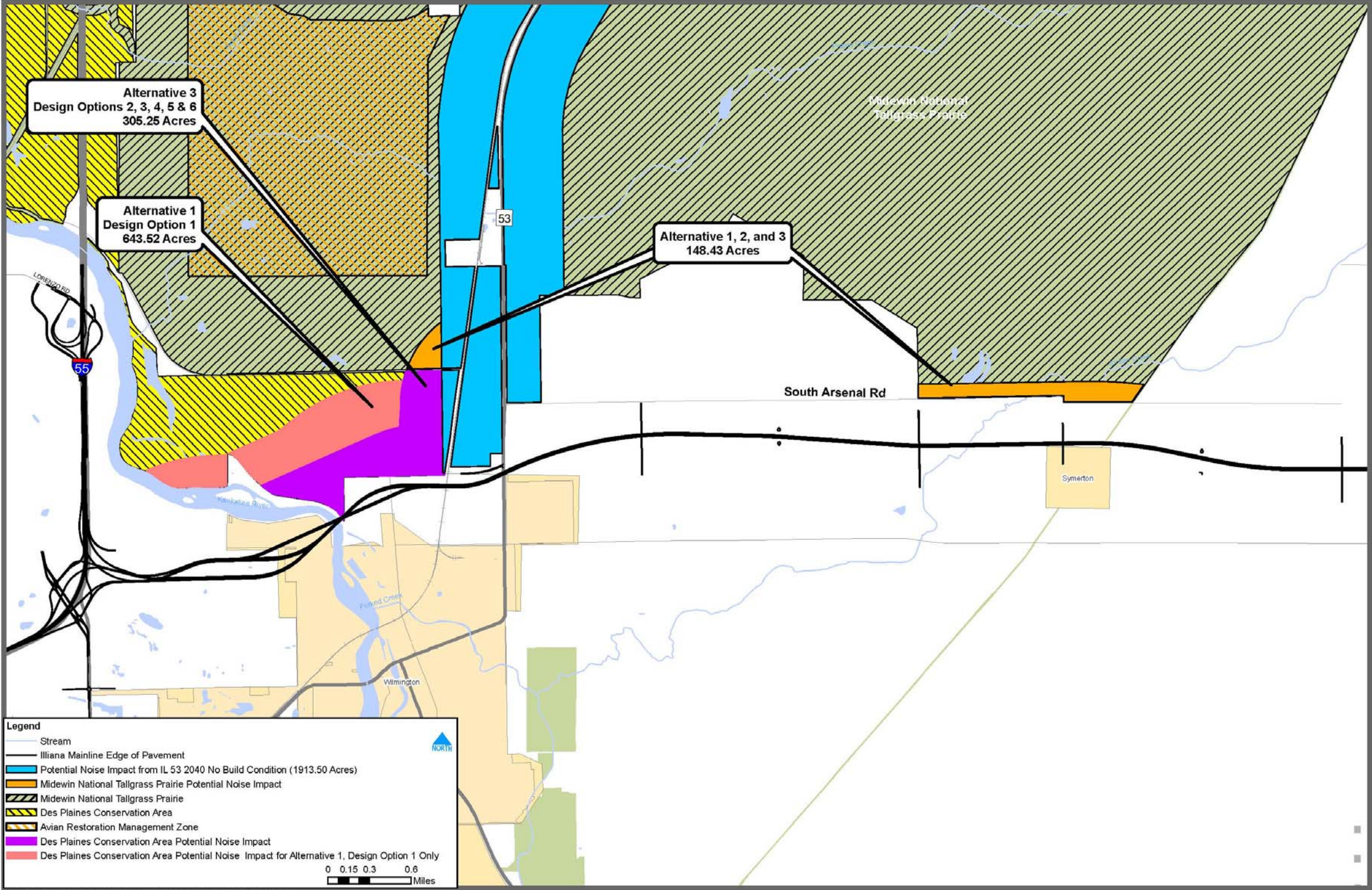
Potential Impact to Existing Passerine and Grassland Bird Habitat

Figure 6-4 depicts the potential impacts to existing passerine and grassland bird habitat as identified by MNTP staff. Alternatives 1, 2, and 3 potentially impact 73.15 acres of existing passerine and grassland bird habitat within MNTP.

Potential Impacts to Upland Sandpiper Habitat

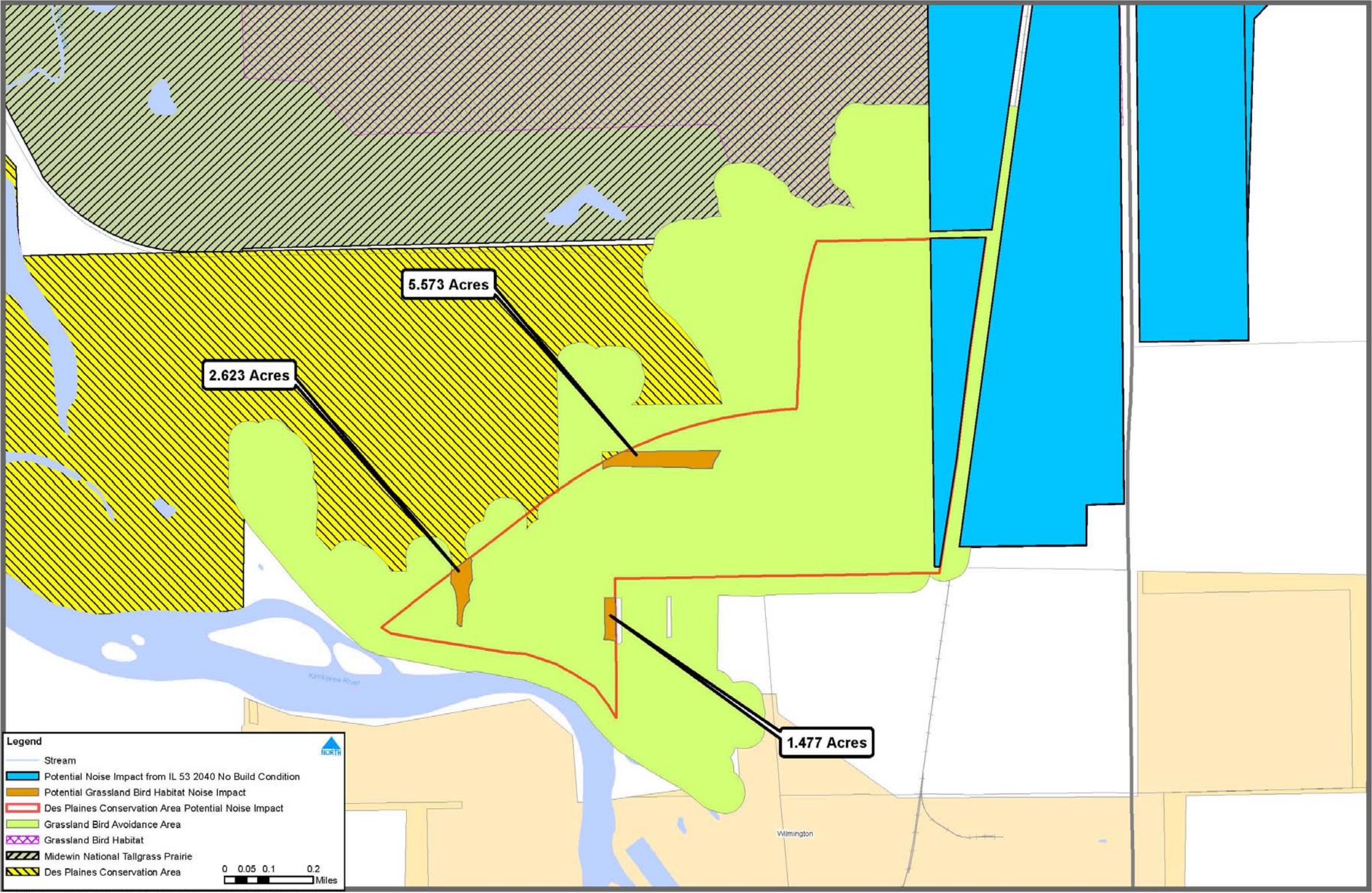
Figure 6-5 depicts the potential impacts to upland sandpiper habitat as identified by MNTP staff. Alternatives 1, 2, and 3 potentially impact 62 acres of upland sandpiper habitat within MNTP.

Figure 6-1. Potential Impacts to DPCA and MNTTP



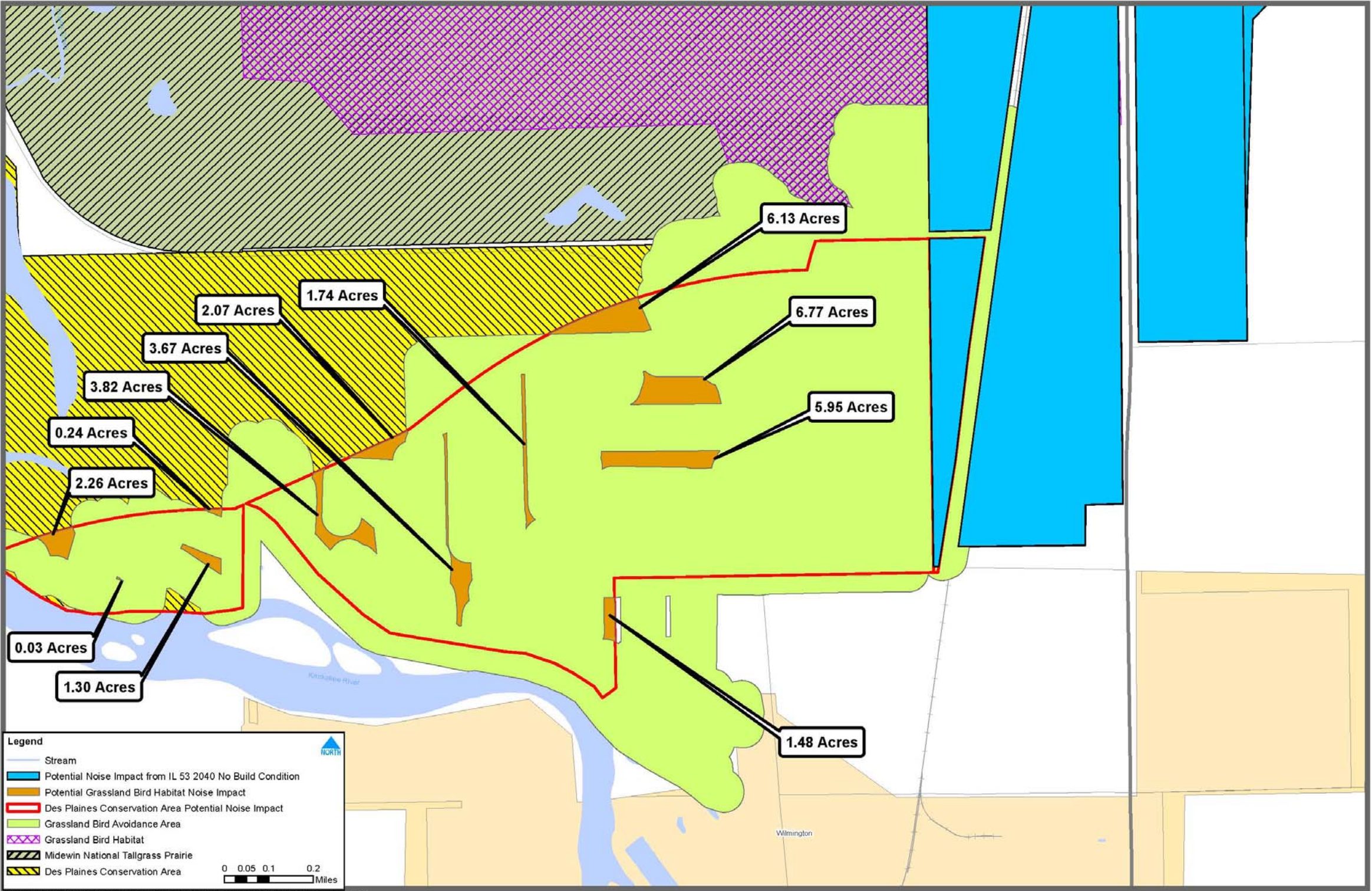
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Figure 6-2. Potential Grassland Birds Habitat within DPCA – Alternative 3 Design Options 2, 3, 4, 5, or 6



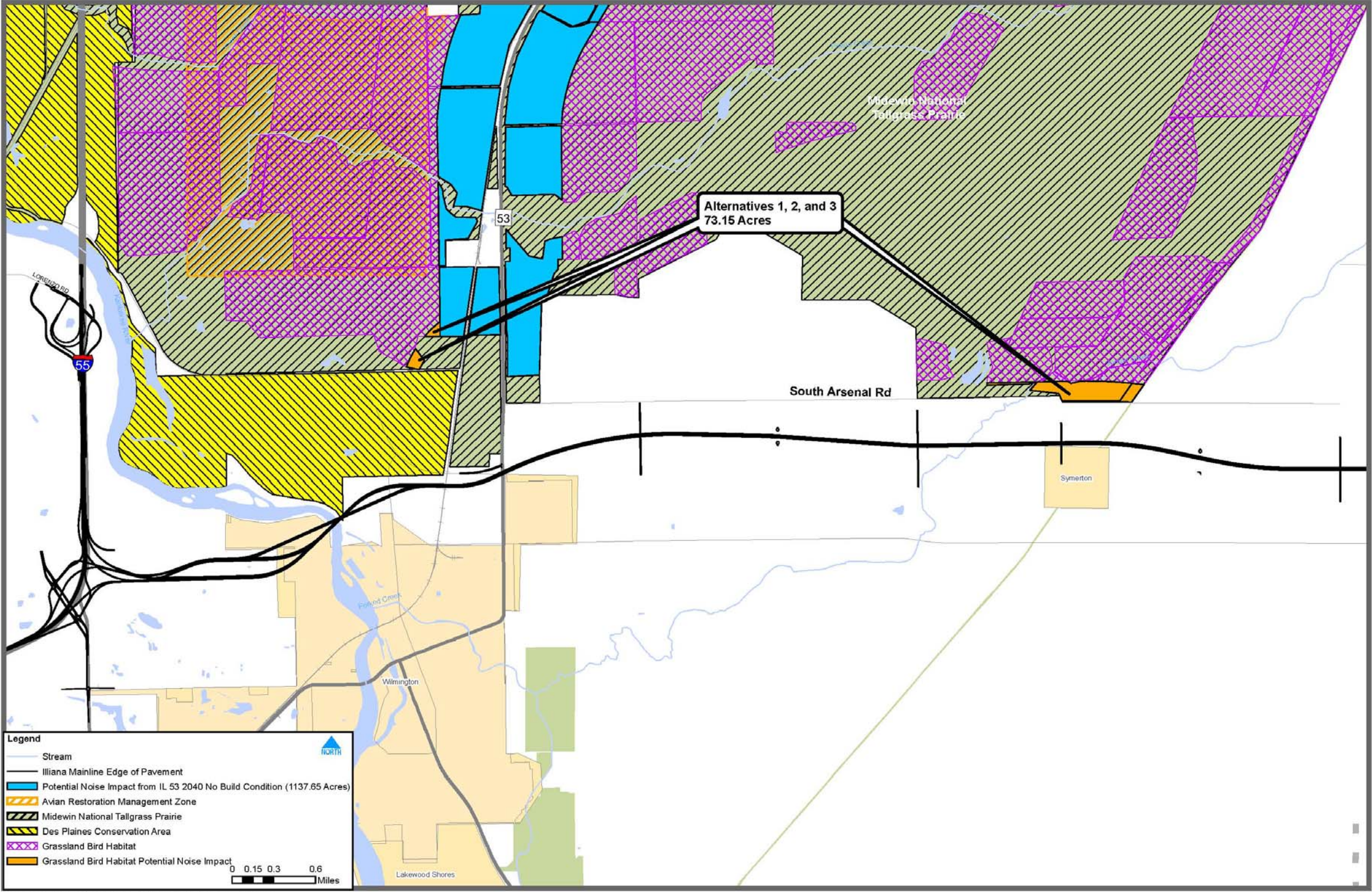
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Figure 6-3. Potential Grassland Bird Habitat within DPCA – Alternative 1 Design Option 1



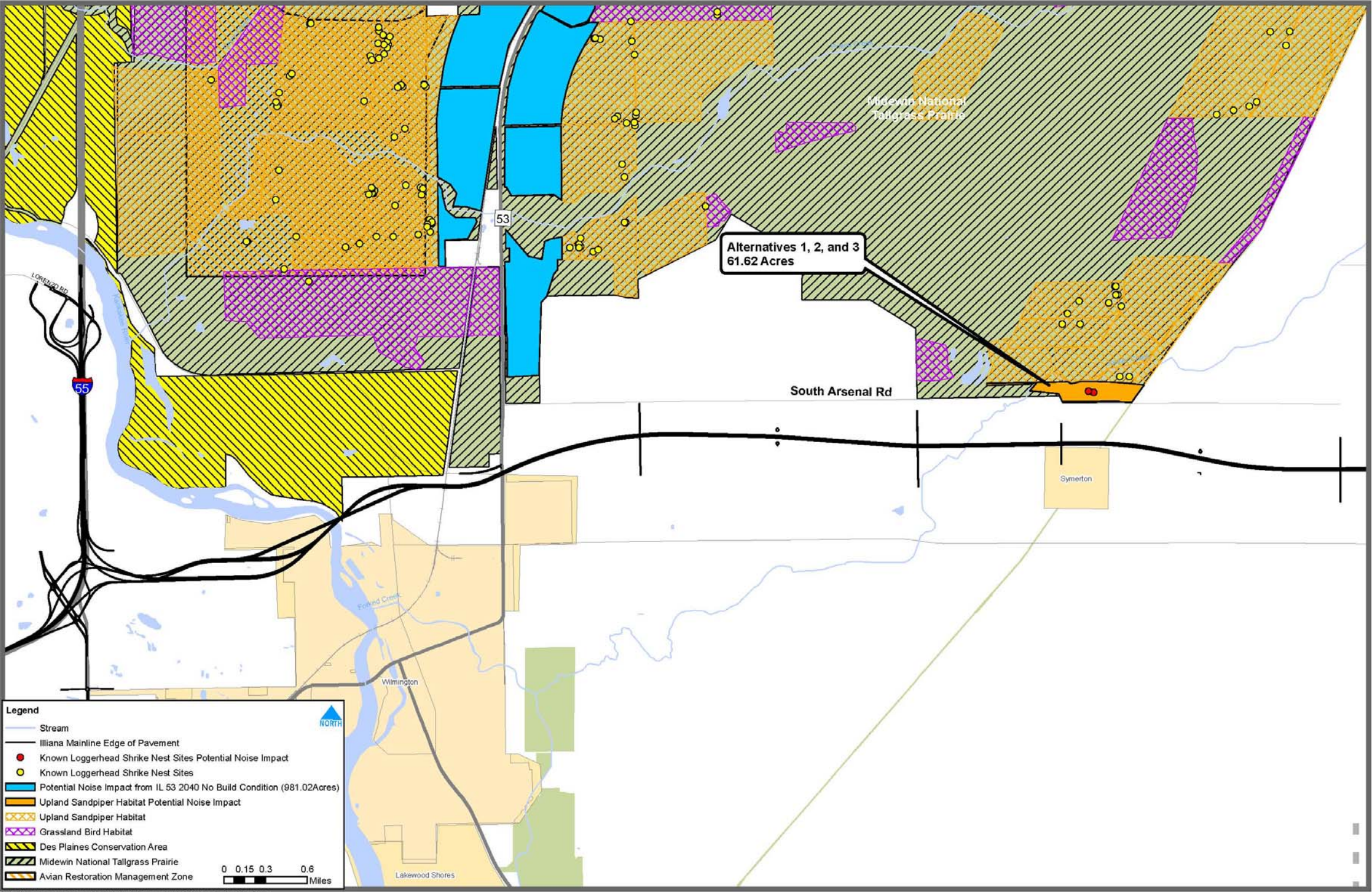
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Figure 6-4. Potential Impacts to Grassland Bird Habitat within MNTTP



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Figure 6-5. Potential Impacts to Upland Snadpiper Habitat and Loggerhead Shrike Nests



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Potential Impacts to Loggerhead Shrike Nest Locations

Figure 6-5 depicts the potential impacts to known loggerhead shrike nest locations as identified by MNTP staff in 2001 and 2003. Alternatives 1, 2, and 3 potentially impact two known loggerhead shrike nest locations.

6.1.3 Other Areas of Grassland Bird Habitat

The land cover type and avian surveys conducted for the proposed project have identified additional potential areas of grassland bird habitat outside of DPCA and MNTP. Several land cover types in Indiana may be potential grassland species habitat. Table 6-4 depicts the land cover types and acreage for potential grassland species habitat within the Corridor in Indiana.

Table 6-4. Potential Grassland Bird Species Land Cover Types within the Corridor in Indiana

Vegetation Cover Type	Alternative 1	Alternative 2	Alternative 3
Grassland / Prairie Remnant	2.5	0.1	0.1
Pasture / Hayland	39.0	25.5	41.8
Non-Native Grassland	38.4	38.3	43.3
Mesic Prairie	2.4	2.4	2.4
Forbland	29.3	34.7	36.4

Source: Cardno JFNew, 2013

While over 100 acres of potential grassland bird habitat is present within the Corridor in Indiana these areas are fragmented and interspersed within a highly agricultural, forested, and residential area. The largest contiguous potential grassland bird habitat is approximately 78 acres located west of Indiana Route 55 (IN-55). The second largest contiguous potential grassland bird habitat is approximately 25 acres. The largest number of fragmented potential grassland bird habitat areas is located within the vicinity of IN-55 and between West Creek and US Route 41 (US 41). Limited potential grassland bird habitat areas are located within the vicinity of Cedar Creek and Lake Dalecarlia.

Avian surveys conducted within Indiana did not identify obligate grassland species or area sensitive grassland species (Cardno JFNew, 2013). However, survey points were mainly not located within or adjacent to land cover associated with potential grassland bird habitat. Several avian species identified utilize grasslands for foraging and nesting.

Projected 2040 ADT for the Illiana Corridor in Indiana is between 16,600 and 18,700, corresponding to a 700 meter impact distance. The 700 meter impact distance extends outside the land cover survey conducted within the Corridor. Therefore, it is assumed that all potential grassland bird habitat within Indiana will potentially be impacted and additional grassland bird habitat may be present within the 700 meter impact distance and outside the Corridor.

6.2 Indirect and Cumulative Impacts to Grassland Birds

It is anticipated the existing, planned, and future land use within the Elwood, Wilmington, and Manhattan development areas, will influence ambient noise levels within MNTP. Planned development including the South Suburban Airport (SSA), RidgePort intermodal facility, and the Chicago to St. Louis high speed rail could further contribute to noise levels in the area.

The Forman et al. (2002) study is considered to take into account variables in addition to masking, such as physiological and behavioral effects, as well as variables not related to roadway noise (air pollution, adjacent anthropogenic noise effects, etc.). Therefore, this study is considered to take into account all potential impact variables, which may overestimate the potential impacts to passerine species from roadway operations (i.e., roadway noise, lighting, air pollution, soil vibration).

7.0 Analysis of Potential Impacts to MNTP

Determining whether the potential impact to MNTP is substantial was assessed based on potential area impacted (as identified in the Draft Environmental Impact Statement [EIS]) and determining the potential population capacity of grassland birds at MNTP. In the Tier One DEIS, it was concluded that the proposed Corridor would impact grassland bird habitat in MNTP. As there were no other potential impacts to MNTP identified, it was determined that the only potential effect to this Section 4(f) entity was grassland bird habitat. The following discussion summarizes additional analysis that was conducted to determine whether the proposed Corridor would impair the use of the MNTP site.

7.1 Literature Review

A literature review was conducted to determine minimum habitat requirements and density estimates to further refine the potential impact to passerine and grassland birds within MNTP.

7.1.1 Habitat Area Requirements

As reported by Kobal et al. (1999), Heckert et al. (1993), it was recommended that for birds most sensitive to fragmentation, grasslands should be greater than 50 hectares (ha) and preferably greater than 100 ha while Vickery et al. (1994) recommended greater than 100 ha and preferably 200 ha. However, area requirements may vary geographically.

Kobal et al. (1999) reported Henslow's sparrows, grasshopper sparrows, and dickcissels were only observed within areas of suitable habitat greater than 16 ha. As reported by Kobal et al. (1999), Heckert (1994) reported only a few species of prairie bird's breed, at low densities, within grasslands less than 10 ha in Illinois and area requirements were 5 ha for eastern meadowlarks, 30 ha for grasshopper sparrows, 40 ha for savanna sparrows, 50 ha for bobolinks, and 55 ha for Henslow's sparrows. Henslow's sparrows, grasshopper sparrows, bobolinks, and eastern meadowlarks were found to be living in grasslands greater than 30 ha (Peterson, 2010).

7.1.2 Population Capacity of Passerine and Grassland Birds

A literature review was conducted to identify estimates of grassland bird density. The density per area depends on the total population of a species and accuracy of the sampling. Population size depends on habitat size and vegetation composition (Kobal et al, 1999; Fritcher et al. 2004; Evrard & Bacon, 1995). Therefore, density per area calculations may not be accurate, especially given the variability and lack of density information available.

As reported by Kobal et al. (1999), Cody (1985) and Graul (1980) report, overall diversity and density are low in grasslands compared to most other habitats and are usually dominated by one or two species. Grassland bird density varies among years and regions, and even within a year and region density varies greatly within prairies (Winter

et al., 2005). The following summarizes the literature reporting density estimates of grassland bird species, known to occur with MNTP. Table 7-1 summarizes the values of grassland bird densities, known to occur with MNTP, from available literature. Table 7-1 indicates that limited data is available for species known to occur with MNTP.

Mundahl et al. (2010) estimated grassland bird density within restored prairies and old-field habitats less than 10 ha in agricultural and urban areas of Winona County, Minnesota. Total grassland bird density ranged from 11.9 to 18.2 between years and different sites, which Mundahl et al. (2010) report that these values were similar to other reported grassland bird densities over larger geographic areas. However, these densities had large standard deviations and the small patch areas studied may have contributed to the lack of native grassland birds observed.

Evrard & Bacon (1995) reported a mean grassland bird nest density of 3.9 per ha (range 1.0-8.3/ha) within a 149 ha grassland in northwest Wisconsin. This grassland bird nest density is similar to a mean of 3.6 nests/ha in Illinois prairie remnants (Westemeier and Buhnerkempe, 1983) and 2.5 nests/ha in Iowa alfalfa fields (Frawley, 1989), as reported by Evrard & Bacon (1995).

Fritcher et al. (2004) estimated mean male grassland bird density at the Fort Pierre National Grassland (46,977 ha) within four seral stages of grasslands. Densities reported for the bobolinks and dickcissels may not be representative as the Fort Pierre National Grassland does not support large populations these two species (Fritcher et al., 2004).

Kobal et al. (1999) estimated grassland bird densities within three grassland types at Forest Preserve District of DuPage County, Illinois, sites. A higher mean density of birds per ha, 4.93, for a grass/forb habitat was determined than from a fescue (4.22 birds per ha) or mixed grass (4.86 birds per ha) habitat types. However, the densities Kobal et al. (1999) estimated are lower than those reported by Graber and Graber (1963) in similar habitat potentially due to the decline in grassland bird populations and densities from the loss of grassland habitat in Illinois.

The National Park Service (NPS, 2012) estimated mean densities of grasshopper sparrows and western meadowlarks at the Agate Fossil Beds National Monument (AFBNM) and compared the results to Pawnee National Grassland (Pawnee) and Comanche National Grassland (Comanche). Densities observed within AFBNM were at least two to four times the densities estimated at Pawnee and Comanche.

Flesch (2008) estimated mean densities of grassland birds at Rancho Los Fresnos in northern Sonora, Mexico. Siegel & Kaschube (2005) estimated mean densities of three grassland bird species at the Naval Air Station in Brunswick, Maine. Winter et al. (2005) estimated savannah sparrows and bobolink densities in grassland patches less than 50 ha to over 250 ha.

Table 7-1. Summary of Grassland Birds Density from Available Literature

Species	Maximum Number Identified per day During 2012 MNTP Avian Survey	Mean Density per ha					Evrard & Bacon, 2005		Fritcher et al., 2004		Winter et al., 2005	
		Minimum Value (# of Values)		Maximum Value (# of Values)		Kobal et al., 1999 ¹	Nest density		Density of Males/ha		Density of Males/ha	
							Minimum Value	Maximum Value	Minimum Value	Maximum Value	Minimum Value	Maximum Value
All Species ²	2,662	0.45	(3)	18.2	(3)	4.22	1.0	8.3	--	--	--	--
Bobolink	242	0.10	(2)	1.10	(2)	0.10	0.1	0.1	0.004	0.086	0.346	0.582
Eastern meadowlark	310	0.06	(3)	3.20	(3)	0.06	0.1	0.1	--	--	--	--
Bell's vireo	1	0.30	(1)	1.50	(1)	0.30	--	--	--	--	--	--
Song sparrow	47	0.02	(1)	0.5	(1)	--	--	--	--	--	--	--
Field sparrow	92	0.31	(1)	1.62	(1)	--	--	--	--	--	--	--
American robin	76	--				--	0.1	0.1	--	--	--	--
Red-winged blackbird	391	0.04	(2)	0.2	(2)	0.11	0.4	5.8	0.020	0.078	--	--
Henslow sparrow	79	0.03	(2)	0.18	(1)	0.03	--	--	--	--	--	--
Upland sandpiper	7	--				--	--	--	0.003	0.137	--	--
Loggerhead shrike ³	27	0.02				--	--	--	--	--	--	--
Dickcissel	358	0.04	(3)	0.54	(3)	0.04	--	--	0.061		--	--
Grasshopper sparrow	141	0.03	(6)	0.84	(6)	0.04	--	--	0.157	0.797	--	--
Savannah sparrow	26	0.05	(3)	2.73	(3)	0.14	0.2	0.2	--	--	0.591	1.252
Sedge wren	9	0.8				--	0.1	0.4	--	--	--	--
Blue-winged teal	1	--				--	0.1	0.9	--	--	--	--
Mourning dove	6	0.2				--	0.1	0.1	--	--	--	--
Common yellowthroat	50	--				--	0.1	0.1	--	--	--	--
Brown headed cowbird	20	--				--	--	--	0.155	0.324	--	--
Blue grosbeak	1	0.07	(1)	0.07	(1)	--	--	--	--	--	--	--

¹ Kobal et al. (1999) values are also included in the minimum and maximum mean density values. Kobal et al. (1999) values are depicted as the study was conducted in close proximity to MNTP.

² The literature review identified mean density estimates for all species in the study.

³ Chabot, 2011. Summary of Loggerhead Shrike Monitoring and Banding in the Midewin National Tallgrass Prairie: 2005 – 2010

Source: Barlow, 1962; Dechant et al., 1998; Herkert, 1998; Kobal et al. (1999); Dechant et al., 1999; Groen & Yurlov, 1999; Hull, 2000; Fritcher et al., 2004; Winter et al., 2005; Siegel & Kaschube, 2005; Evrard & Bacon, 2005; Quamen, 2007; Flesch (2008); Mundahl, 2010; Chabot, 2011; NPS, 2012; The Birds of North America Online, 2013.

7.2 Methodology for Analysis

7.2.1 Habitat Area Requirements

Patch sizes for current grassland and future desired grassland bird habitat were determined and compared to the minimum size required of area sensitive species. The MNTP Land and Resource Management Plan identifies the desired future land cover of MNTP. Figure 7-1 depicts the current and future desired grassland bird habitat patch sizes. Table 7-2 depicts the desired future conditions cover types for MNTP. It is expected that passerine and grassland bird species will utilize grassland habitat and native restoration cover types in the desired future conditions. Savannah types were not included as passerines avoid woody edges (Quamen, 2007) and prefer not to nest within 50 meters of trees (Peterson, 2010).

Table 7-2. MNTP Desired Future Conditions Land Cover

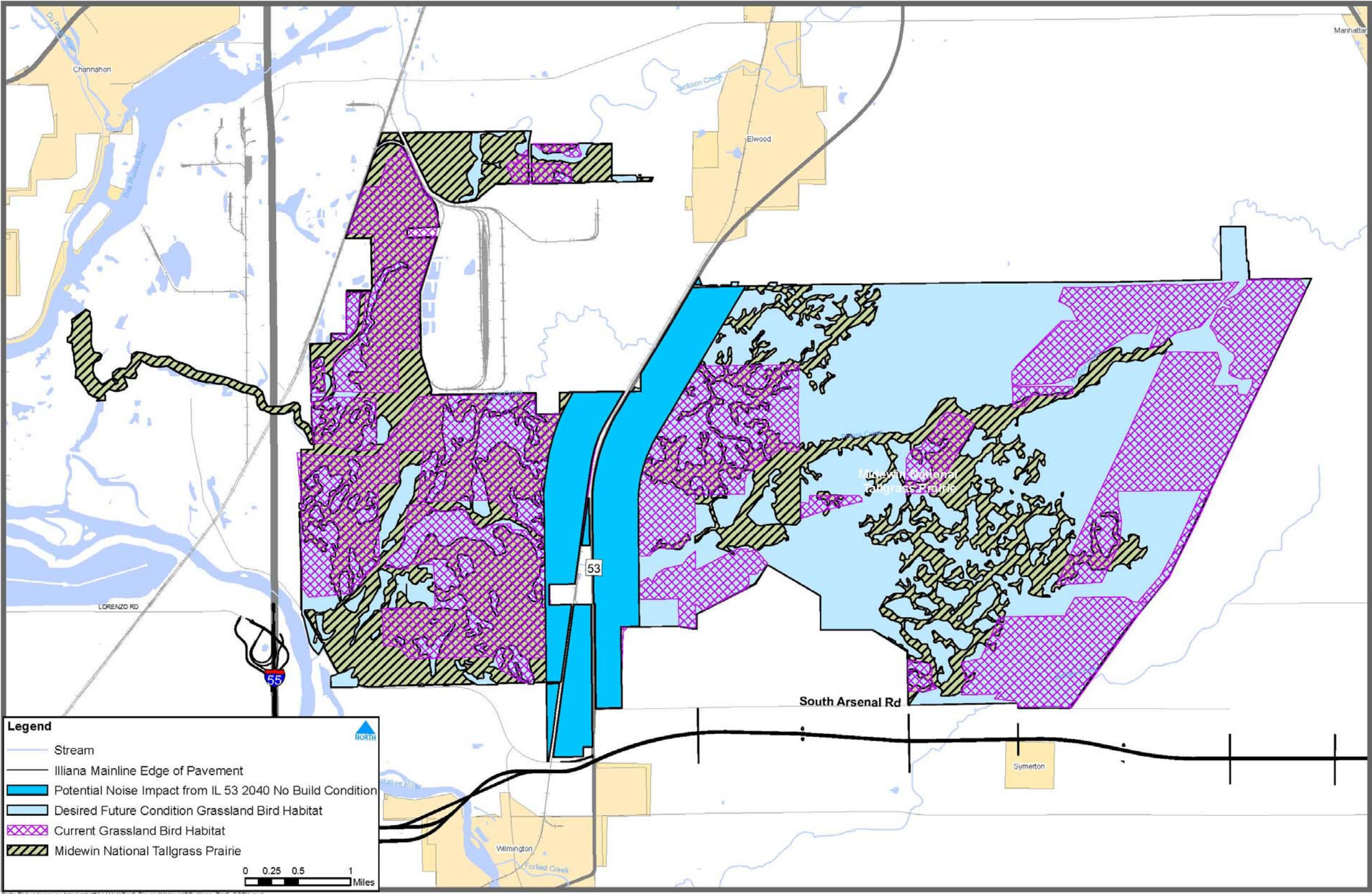
Cover Type	Total Area (ha)
Forest/Woodlands	203
Grassland Habitat	2,748
Native Restoration	1,712
Savanna	202
Wetland Restoration	2,084
Total	6,949

Source: MNTP GIS information; Land and Resource Management Plan, 2002

7.2.2 Population Capacity of Passerine and Grassland Birds

Carrying capacity is the number of animals the resources (e.g., food, water) of a given area of land or water can support over time. Population capacity is the maximum number of a given species within an area (e.g., territory requirement). An estimate of population capacity was determined by identifying the density of grassland birds species and multiplied by the available habitat. In addition, an estimate of the amount of required habitat to support the existing estimated population of grassland bird species within MNTP was calculated. The population of birds within MNTP was estimated using the MNTP 2012 avian survey data. As the survey was conducted over a 5 day period the maximum number of a species identified on a given day was selected as an indication of the species population within MNTP. Portions of the survey data did not include dates; the total number of individuals from the data without dates was assumed to occur on the date where the maximum number of a species was identified.

Figure 7-1. Current and Desired Future Grassland Bird Habitat within MNTTP



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Based on the available literature, potential area required to meet current population estimates, potential population capacity, potential nest capacity, and potential population capacity of male birds could be evaluated to determine the impact on grassland birds within MNTP. As Table 7-1 indicates, a minimum and maximum density value was obtained from the literature. Therefore, minimum and maximum values were calculated. Values were also calculated for current grassland bird habitat and the desired future conditions.

For the current grassland habitat, it is anticipated vegetation composition is assumed not to be optimal. For the desired future conditions, vegetation composition is assumed to be optimal for a given species as one of the goals of the MNTP Prairie Plan is restoring habitat for grassland birds. The MNTP Prairie Plan does not specify specific grassland types. Therefore, vegetation composition of the restored areas should match the vegetation composition that maximizes the amount of a given species in an area.

7.3 Analysis Results

7.3.1 Habitat Requirements

The alternatives potentially impact 73.19 (or 0.9 percent) of the 3,265 hectares of current grassland bird habitat within MNTP (MNTP GIS information). The alternatives would potentially impact 50 (or 1.3 percent) of the 3,978 ha of potential passerine and grassland bird habitat for the future desired conditions. Figure 7-1 and Table 7-3 indicate that with the Illiana Corridor there are several patches that meet the minimum size requirement for the most area sensitive species.

Table 7-3. Distribution of Grassland Bird Habitat Patch Sizes within MNTP

Grassland Bird Habitat Patch Area (ha)	Current Grassland Bird Habitat Number of Patches		Desired Future Grassland Bird Habitat Number of Patches	
	Without Potential Impact	With Potential Impact	Without Potential Impact	With Potential Impact
0-4	0	0	40	40
5-9	2	2	18	18
10-19	3	3	15	15
20-39	2	2	4	4
40-99	2	2	9	9
100-199	1	1	1	1
200-499	5	5	0	0
500-999	2	2	1	1
1,000+	0	0	1	1
Total	17	17	89	89

Source: MNTP GIS information; Land and Resource Management Plan, 2002

Table 7-3 depicts the distribution of grassland habitat patch sizes within MNTP. The desired future conditions indicate a total of 89 distinct patches of grassland bird habitat within MNTP. The distribution of patch size changes with the desired future condition as future restoration will convert current non-grassland bird habitat and incorporate current small patches into much larger patches. Future grassland bird habitat will decline within MNTP, west of IL-53, as the desired future conditions indicate native restoration intermixed with wetland restoration within this area.

Figure 7-2 and Figure 7-3 depict the potential noise impacts on four different current grassland habitat patches. The potential noise impacts constitute minor areas of the total patch size areas, except for the patch between IL-53 and the UPRR. Figure 7-4 and Figure 7-5 depict the potential noise impact on one current grassland habitat patch.

Given the large expanse of the patches potentially impacted it is not expected that an area sensitive species would be impacted. MNTP would still support patches of grassland habitat that exceed the minimum area requirements of the most area sensitive species.

Figure 7-2. Potential Current Grassland Bird Habitat Noise Impact within MNTP – West

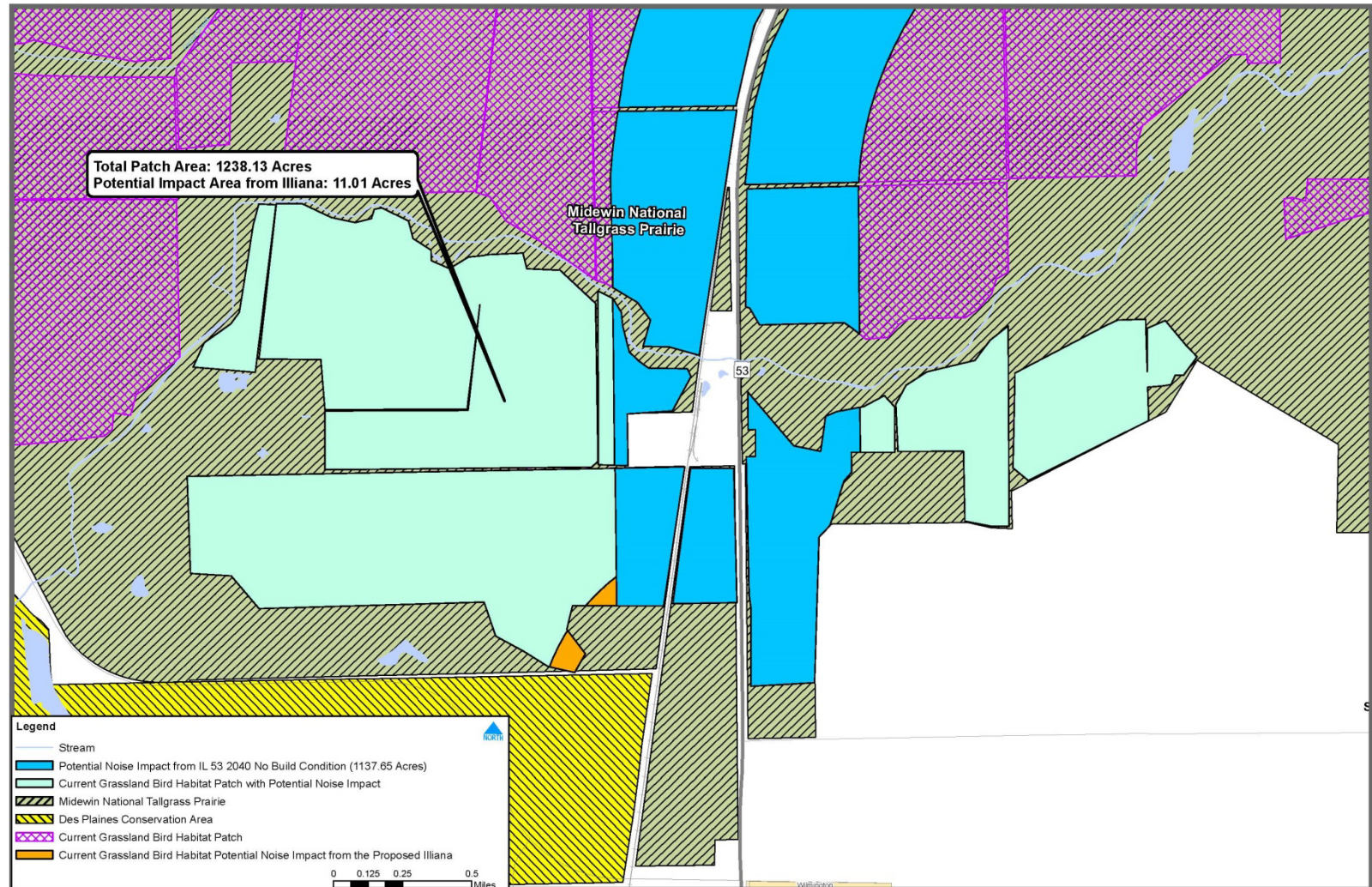


Figure 7-3. Potential Current Grassland Bird Habitat Noise Impact within MNTP – East

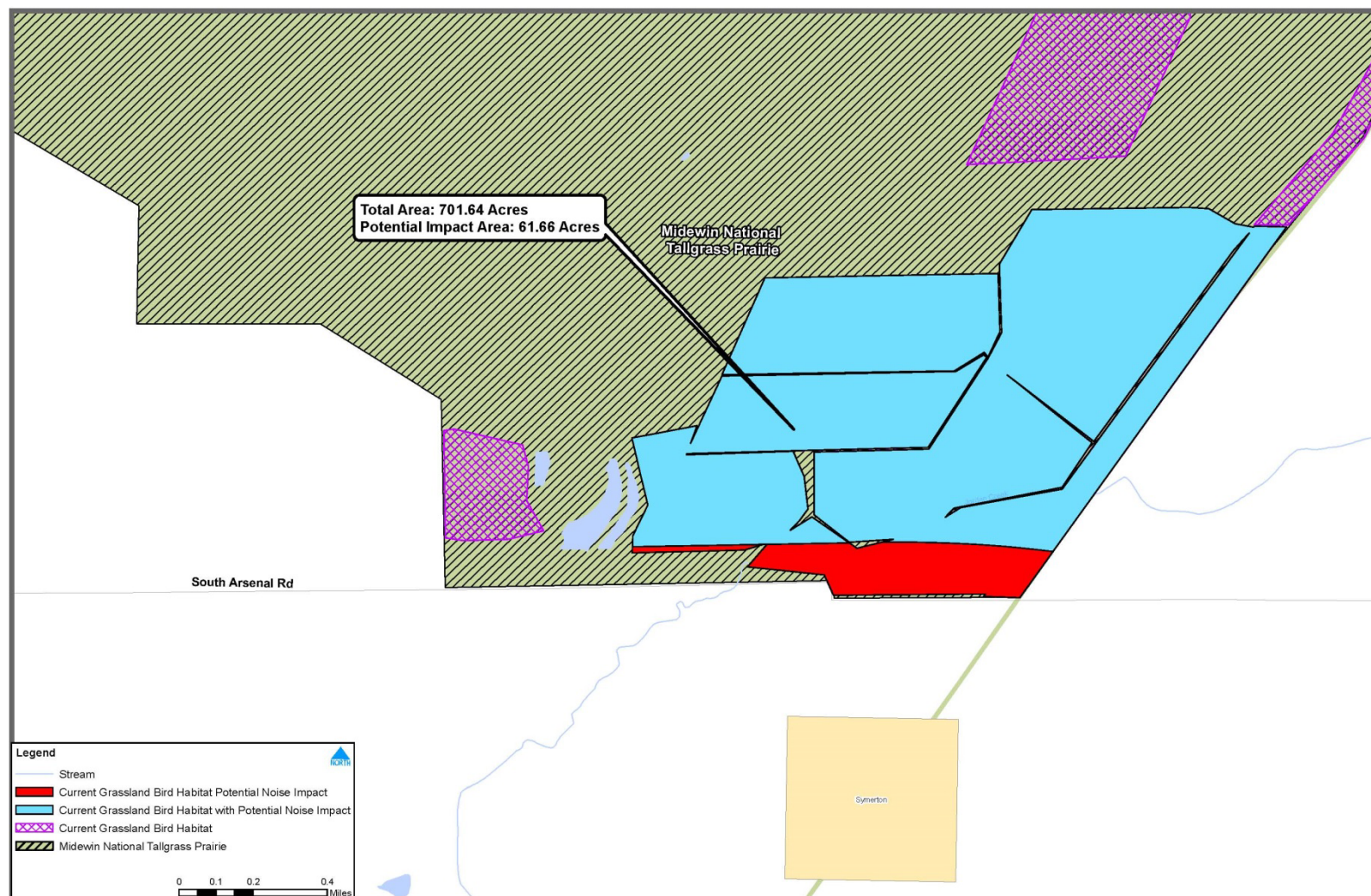


Figure 7-4. Potential Desired Future Conditions Grassland Bird Habitat Noise Impact within MNTP – West

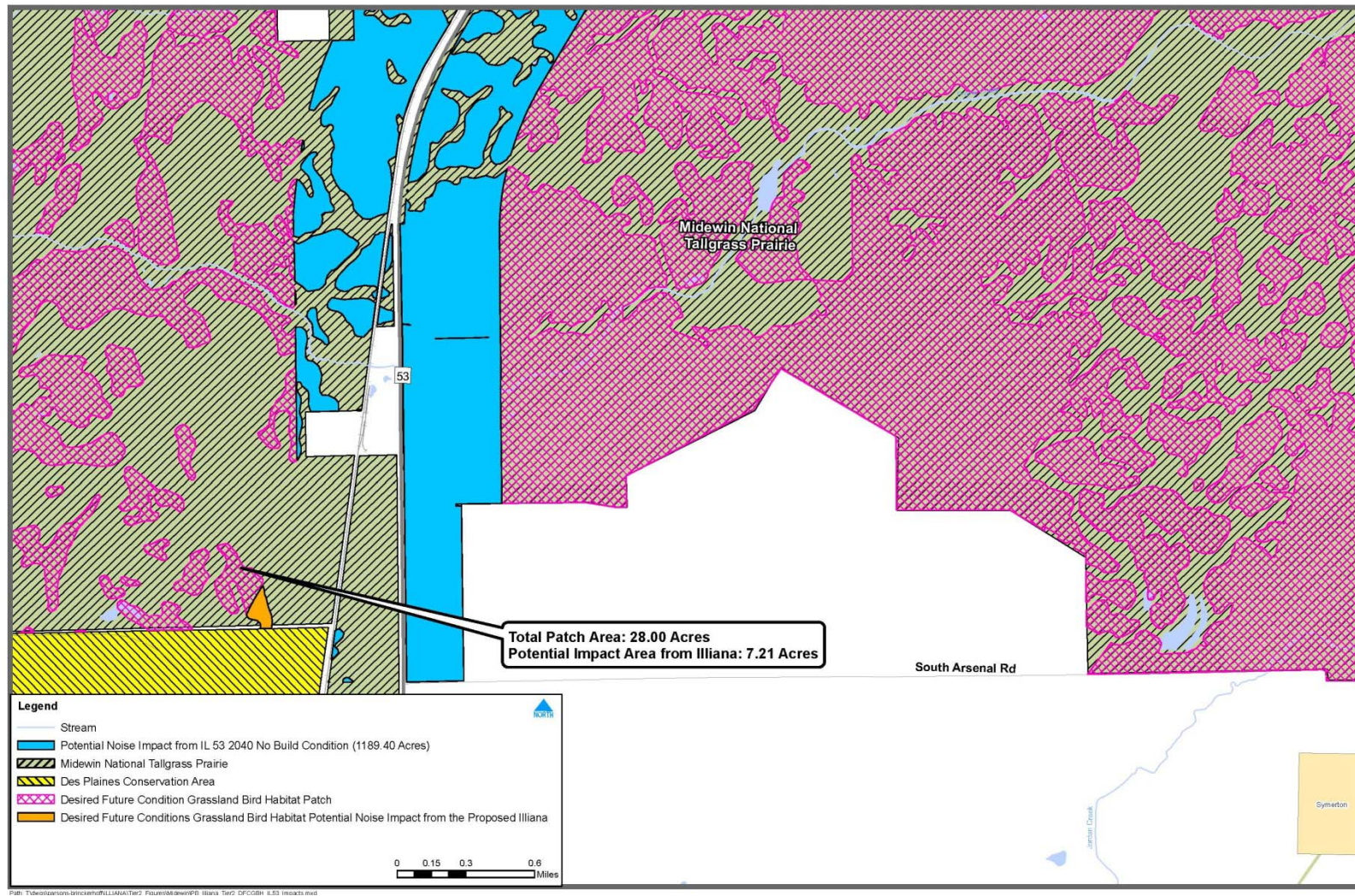
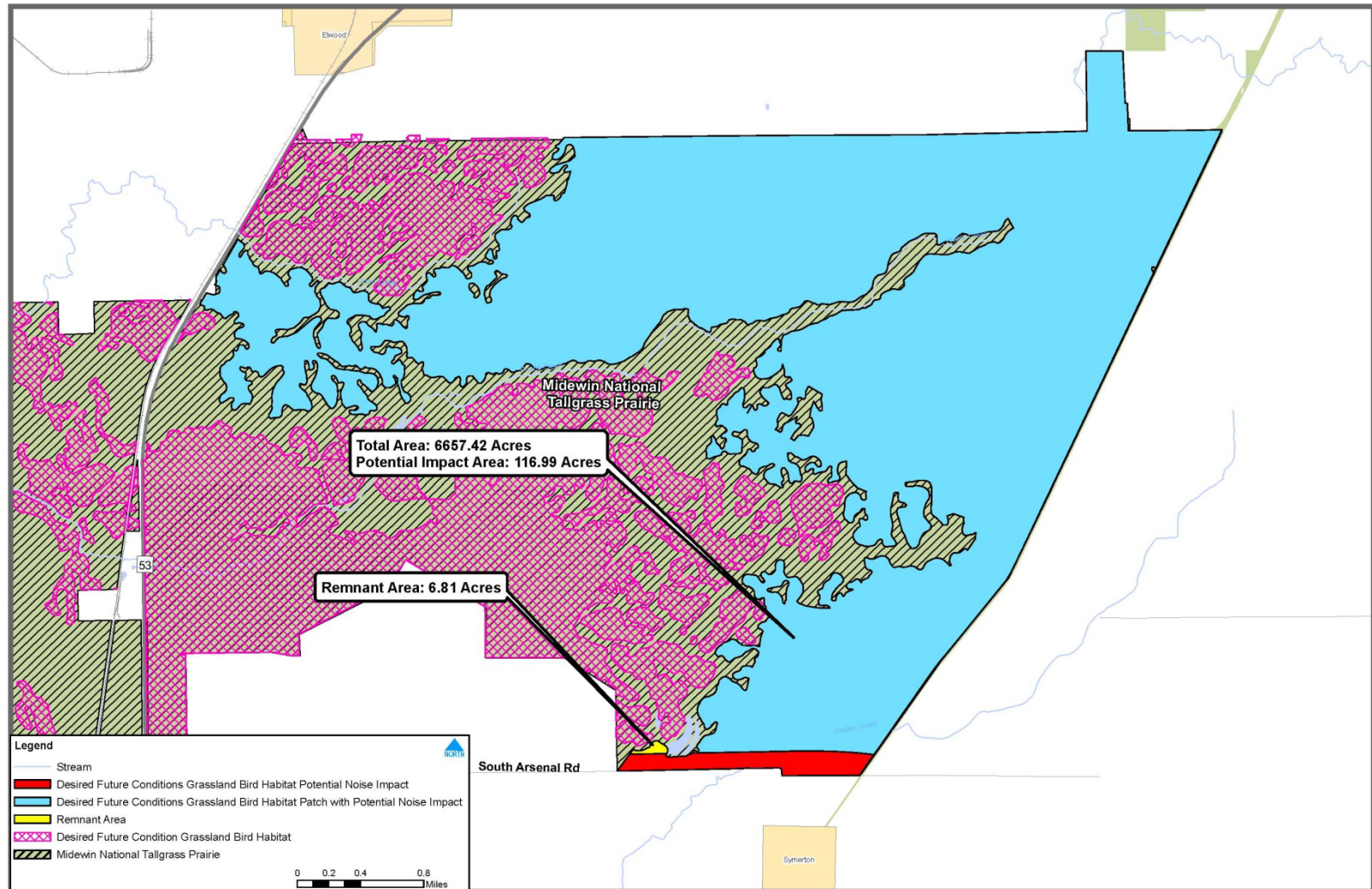


Figure 7-5. Potential Desired Future Conditions Grassland Bird Habitat Noise Impact within MNTP – East



7.3.2 Population Capacity of Passerine and Grassland Birds

Potential Population Capacity

To determine the potential area to meet current population estimates, the population of each species was multiplied by the inverse of the density per area. The result is the potential habitat area needed to meet the current population capacity. Table 7-4 summarizes the additional potential suitable habitat within MNTP for each species.

Table 7-4. Additional Potential Habitat within MNTP

Species	Within Current Grassland Birds Habitat (ha) ¹			Within Desired Future Grassland Bird Habitat (ha) ¹		
	Using Minimum Density/ha Value	Using Maximum Density/ha Value	Using Kobal et al., 1999	Using Minimum Density/ha Value	Using Maximum Density/ha Value	Using Kobal et al., 1999
All Species	(2,680)	3,089	2,605	(1,987)	3,782	3,297
Bobolink	815	3,015	815	1,508	3,708	1,508
Eastern meadowlark	(1,931)	3,139	(1,931)	(1,238)	3,831	(1,238)
Bell's vireo	3,232	3,235	3,232	3,925	3,928	3,925
Song sparrow	885	3,141	--	1,578	3,834	--
Field sparrow	2,939	3,179	--	3,631	3,871	--
Red-winged blackbird	(6,540)	1,280	(319)	(5,847)	1,973	374
Henslow sparrow	602	2,797	602	1,295	3,489	1,295
Loggerhead shrike	3,234.86		--	2,578		--
Dickcissel	(5,715)	2,572	(5,715)	(5,022)	3,265	(5,022)
Grasshopper sparrow	(1,465)	3,068	(290)	(772)	3,760	403
Savannah sparrow	2,715	3,226	3,050	3,408	3,919	3,742
Sedge wren	3,224		--	3,917		--
Mourning dove	3,205		--	3,898		--
Blue grosbeak	3,221		--	3,914		--

¹ Takes into account the 29.6 ha (Current Grassland Habitat) and 50.26 ha (Desired Future Conditions Grassland Habitat) impact.
 (###) estimated area of additional habitat over what the estimate of population predicts given the density.

As indicated in Table 7-4, the minimum density values for the eastern meadowlark, red-winged blackbird, dickcissel, and grasshopper sparrow predict additional habitat is needed to support the population estimates. Using the maximum density values, there is an abundance of suitable habitat present. The values calculated in Table 4-4 and Table 4-5 assumes an 29.6 hectare and a 50.26 hectare impact for the current grassland bird

habitat and desired future grassland bird habitat, respectively. The values calculated in Table 7-4 and Table 7-5 not taking into account the potential impact to MNTP, do not vary significantly.

Table 7-5. Additional Population of Birds within MNTP

Species	Within Current Grassland Birds Habitat ¹			Within Desired Future Grassland Bird Habitat ¹		
	Using Minimum Density/ha Value	Using Maximum Density/ha Value	Using Kobal et al., 1999	Using Minimum Density/ha Value	Using Maximum Density/ha Value	Using Kobal et al., 1999
All Species	(1,206)	56,222	10,991	(894)	68,831	13,915
Bobolink	82	3,317	82	151	4,079	151
Eastern meadowlark	(116)	10,043	(116)	(74)	12,260	(74)
Bell's vireo	970	4,852	970	1,177	5,891	1,177
Song sparrow	18	1,571	--	32	1,917	--
Field sparrow	911	5,149	--	1,126	6,272	--
Red-winged blackbird	(262)	256	(35)	(234)	395	41
Henslow sparrow	18	503	18	39	628	39
Loggerhead shrike	38		--	52		--
Dickcissel	(229)	1,389	(229)	(201)	1,763	(201)
Grasshopper sparrow	(44)	2,577	(12)	(23)	3,159	16
Savannah sparrow	136	8,807	427	170	10,698	524
Sedge wren	2,579		--	3,134		--
Mourning dove	641		--	780		--
Blue grosbeak	225		--	274		--

¹ Takes into account the 29.6 ha (Current Grassland Habitat) and 50.26 ha (Desired Future Conditions) impact
 (###) estimated number of additional individuals over what the estimate of density predicts given the population.

The Kobal et al. (1999) density estimate for all species indicates that suitable habitat is present within MNTP and the potential impact to grassland bird species within MNTP will reduce additional available habitat by 1.3 percent for the desired future conditions.

To determine the potential population capacity, the density per area was multiplied by the available habitat. The result is the potential population supported by suitable habitat within MNTP. Table 7-5 summarizes the additional population of birds that could be supported within MNTP given density and population estimates.

Potential Nest Capacity

To obtain potential nest capacity, the average nest density was multiplied by the available habitat. The result is the potential habitat area needed to meet the current population capacity. The result is the potential number of nests supported by habitat

within MNTP. Table 7-6 summarizes the number of potential nests within MNTP using average nest density values. As reported by Evrard & Bacon (1995), Westemeier & Buhnerkempe (1983) reported a mean nest density of 3.6 nests per hectare in Illinois prairie remnants. Therefore, it is anticipated the average nest density within MNTP could reach the average density as reported by Westemeier & Buhnerkempe (1983). Table 7-7 summarizes the range of potential nest within MNTP for all species and specific species known to occur within MNTP.

Table 7-6. Number of Potential Nests within MNTP – Average Nest Density

	Average Nest Density (/ha)	Current Grassland Birds Habitat within MNTP¹ (ha)	Desired Future Grassland Bird Habitat within MNTP¹ (ha)	Number of Potential Nests within Current Grassland Bird Habitat in MNTP¹	Number of Potential Nests within Desired Future Grassland Bird Habitat in MNTP¹
Evrard & Bacon, 2005	3.9	3,235	3,928	12,618.06	15,320.02
Westemeier and Buhnerkempe, 1983	3.6			11,647.44	14,141.56
Frawley, 1989	2.5			8,088.50	9,820.53

¹ Takes into account the 29.6 ha (Current Grassland Habitat) and 50.26 ha (Desired Future Conditions) impact.

Table 7-7. Number of Potential Nests within MNTP

Species	Within Current Grassland Bird Habitat in MNTP¹		Within Desired Future Grassland Bird Habitat in MNTP¹	
	Using Minimum Nest/ha Value	Using Maximum Nest/ha Value	Using Minimum Nest/ha Value	Using Maximum Nest/ha Value
All Species	3,235	26,854	3,928	32,604
Bobolink	324		393	
Eastern meadowlark	324		393	
American robin	324		393	
Red-winged blackbird	1,294	18,765	1,571	22,784
Savannah sparrow	647		786	
Sedge wren	324	1,294	393	1,571
Blue-winged teal	324	2,912	393	3,535
Mourning dove	324		393	
Common yellowthroat	324		393	

¹ Takes into account the 29.6 ha (Current Grassland Habitat) and 50.26 ha (Desired Future Conditions) impact.

Potential Population Capacity of Male Birds

To determine the potential population of male birds, the density of male birds per area was multiplied by the available habitat. The result is the potential population of male birds supported by suitable habitat within MNTP. Table 7-8 summarizes the potential number of male birds within MNTP.

Table 7-8. Potential Number of Males within MNTP

Species	Within Current Grassland Bird Habitat in MNTP ¹		Within Desired Future Grassland Bird Habitat in MNTP ¹	
	Using Minimum density/ha Value	Using Maximum density/ha Value	Using Minimum density/ha Value	Using Maximum density/ha Value
Bobolink	13	1,883	16	2,286
Red-winged blackbird	65	252	79	306
Upland sandpiper	10	443	12	538
Dickcissel	197		240	
Grasshopper sparrow	508	2,579	617	3,131
Savannah sparrow	1,912	4,051	2,322	4,918
Brown headed cowbird	501	1,048	609	1,273

¹ Takes into account the 29.6 ha (Current Grassland Habitat) and 50.26 ha (Desired Future Conditions) impact.

Given the density, the estimated area of habitat required to support the estimated population of eastern meadowlark, red-winged blackbird, dickcissel, and grasshopper sparrow populations is still greater than the current or desired future grassland habitat. Alternatively, given the estimated population, the additional number of individual's for eastern meadowlarks, red-winged blackbirds, dickcissels, and grasshopper sparrows is still greater than what the minimum density would predict for the current or desired future grassland habitat.

Conclusion

Table 7-9 summarizes the predicted population within MNTP using the minimum density estimates. For the loggerhead shrike, total population within MNTP was estimated during 2010 at 27 individuals (Chabot, 2011). Given the minimum density estimate, current and future grassland habitat within MNTP (assuming potential impact from MNTP) will support up to 65 loggerhead shrikes. Therefore, if the proposed Illiana Corridor project has an impact to loggerhead shrike habitat, individuals would relocate to other areas of MNTP which have to been calculated to support an additional 38 individuals. The potential area of impact to current and future desired grassland bird habitat accounts for approximately 1 percent of the total current and future desired grassland bird habitat. For several species, the potential population within MNTP surpasses the expected population using the minimum density indicating that this density value is higher within MNTP currently. Given the large expanse of grassland bird habitat it is not expected that an area sensitive species would surpass its population

capacity within MNTP by losing 1 percent of its habitat. MNTP would still support patches of grassland habitat that exceed the minimum area requirements of the most area sensitive species. If a species currently has a low density per area and would be impacted by the proposed Illiana Corridor project, the future restoration would improve habitat that could increase the species density. Therefore, there is no substantial impact to grassland birds within MNTP.

Table 7-9. Predicted Population within MNTP Using Minimum Density Estimates

Species	Without Potential Impact	With Potential Impact	Difference	Maximum Number Identified per day During 2012 MNTP Avian Survey
All Species	1,469	1,456	(13)	2,662
Bobolink	327	324	(3)	242
Eastern meadowlark	196	194	(2)	310
Bell's vireo	980	971	(9)	1
Song sparrow	65	65	(1)	47
Field sparrow	1,012	1,003	(9)	92
American robin	--	--	--	76
Red-winged blackbird	131	129	(1)	391
Henslow sparrow	98	97	(1)	79
Upland sandpiper	--	--	--	7
Loggerhead shrike ¹	65	65	(1)	27
Dickcissel	131	129	(1)	358
Grasshopper sparrow	98	97	(1)	141
Savannah sparrow	163	162	(1)	26
Sedge wren	2,612	2,588	(24)	9
Blue-winged teal	--	--	--	1
Mourning dove	653	647	(6)	6
Common yellowthroat	--	--	--	50
Brown headed cowbird	--	--	--	20
Blue grosbeak	229	226	(2)	1

¹Chabot, 2011. Summary of Loggerhead Shrike Monitoring and Banding in the Midewin National Tallgrass Prairie: 2005 – 2010

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8.0 Conclusion

Based on the available literature, assumptions, and limitations of studies completed to date, a review of the ecological and biological characteristics of passerine species studied and those known to occur within MNTP, it was determined that the Forman et al. (2002) study presents the most applicable methodology for purposes of assessing potential impacts to grassland avian species associated with the Illiana Corridor. The criteria for assessing potential impacts to grassland bird species was presented to the Resource Agencies (USFWS, USEPA, USACE, Illinois DNR, and MNTP) on April 16, 2013. Concurrence on using distance as the criteria for assessing potential impacts to grassland bird species was given at this meeting.

Utilizing the Forman et al. (2002) study, potential areas of impact within the boundaries of MNTP and DPCA, existing passerine and grassland bird habitat, and upland sandpiper habitat were calculated. In addition, the potential number of known loggerhead shrike nests impacted were calculated. Table 8-1 summarizes the potential impacts to DPCA, MNTP, and avian habitat. The alternatives and design options all potentially impact the same amount of area within MNTP.

Table 8-1. DPCA, MNTP, and Avian Habitat of Potential Impact

Alternative	Area of Impact within DPCA (Acres)	Area of Impact within MNTP (Acres)	Area of Impact to Existing Passerine and Grassland Bird Habitat (Acres)¹	Area of Impact to Upland Sandpiper Habitat (Acres)^{1,2}	Number of Loggerhead Shrike Nest Impacts¹
Alternative 1	330-644 ³	149	73.15	62	2
Alternative 2	323-598 ³	149	73.15	62	2
Alternative 3	305-615 ³	149	73.15	62	2

¹ Only located within Midewin National Tallgrass Prairie property.

² The area of upland sandpiper habitat is located wholly within the passerine and grassland bird habitat.

³ Design Options 2, 3, 4, 5, and 6 impact the least amount of area and Design Option 1 impacts the largest amount of area

Utilizing the distances calculated by Forman (2002) to determine potential impacts to DPCA and the most conservative distance grassland birds avoid tree lines where it was determined that there are limited remaining potential habitat patches within the DPCA which vary in size from 0.03 acres to 6.77 acres. As previously stated, the potential habitat is currently agricultural land and the DPCA currently has no plans to restore this or adjacent areas to grassland bird habitat. Therefore, it is anticipated that grassland birds are not using these areas within the DPCA. There are no impacts to grassland birds within the DPCA.

As presented in 7.1, a literature review was conducted to estimate population capacity of MNTP and an analysis to determine whether the potential impacts would decrease grassland patch sizes below minimum requirements of a sensitive species. Given the

large expanse of grassland bird habitat it is not expected that an area sensitive species would surpass its population capacity within MNTP by losing 1 percent of its habitat. MNTP would still support patches of grassland habitat that exceed the minimum area requirements of the most area sensitive species. If a species currently has a low density per area and would be impacted by the proposed Illiana Corridor project, the future restoration would improve habitat that could increase the species density. Therefore, there is no substantial impact to grassland birds within MNTP.

Several land cover types in Indiana may be potential grassland bird habitat. While over 100 acres of potential grassland bird habitat is present within the Corridor in Indiana these areas are fragmented and interspersed within a highly agricultural, forested, and residential area. Additional grassland bird habitat in Indiana may be present within the 700 meter impact distance and outside the Corridor.

Studies correlating distance with reduced breeding or foraging are considered to take into account all potential variables, which may overestimate the potential impacts to passerine species from roadway operations (i.e. roadway noise, lighting, air pollution, etc.). Therefore, studies correlating distance with reduced breeding or foraging was determined to be a conservative measure of the potential for roadways to impact grassland species. Mitigation for potential impacts to grassland bird habitat will be developed and coordinated with the resource agencies (USFWS, US EPA, USACE, IDNR, and MNTP).

9.0 References

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